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JULY 3RD—DECEMBER 25TH, 1852.

EDITED BY R. A. BROOMAN.

VOL. LVII.

" Each carefully observed fact is an heirloom to mankind; and he who verifies a new phenomenon does more, perhaps, for science than he who constructs a theory."—TOWNSHEND.

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1852.

ALPHABETICAL LIST OF NEW PATENTS GRANTED FOR ENGLAND, SCOTLAND, AND IRELAND.

Name.	Subject.	England.	Scotland.	Ireland.	Page.
Ackroyd	Yarn and fabrics	31 July	6 Aug.	....	119, 180
Adamson and Cooper	Steam engines and boilers	12 Aug.	....	....	140
Allan	Electricity	24 June	....	....	20
Amies	Braid	12 Aug.	....	....	140
Andrews	Coke ovens	6 July	....	....	39
Andrews	Cutting, punching, stamping, &c.	7 Oct.	....	....	300
Arnier	Steam boilers	6 Nov.	....	....	400
Barrington	Boiler feeding apparatus	15 July	....	....	60
Bazley	Combing machinery	24 June	....	....	20
Bealey	Bleaching	20 July	....	....	80
Bekaert	Zinc white	12 Aug.	....	....	140
Bell	Sulphuric acid	24 June	....	....	20
Bellford	Sheet iron	29 July	....	....	99
Bellford	Printing fabrics	26 Aug.	....	....	179
Bellford	Boots and shoes	30 Sept.	....	....	280
Bellford	Springs	25 Nov.	....	....	440
Beltzung	Bottles and jars	30 Sept.	....	17 Aug.	220
Bernard	Leather, boots, shoes, &c.	....	....	25 May	100
Bernard	Boots and shoes	10 Sept.	....	....	240
Bessemer	Sugar and evaporating	24 July	....	....	99
Bessemer	Expressing saccharine fluids	....	....	11 Sept.	320
Billson and Bedells	Articles of dress	30 Sept.	....	....	280
Birckton and Lawson	Articles of dress	21 July	....	....	80
Blakey and Skaife	Mills	6 July	....	....	39
Boggett and Pettit	Light and heat	21 Oct.	....	....	340
Bovill	Meal and flour	15 July	....	....	60
Bright and Bright	Telegraphic apparatus	21 Oct.	....	....	340
Brooman	Reaping machine	....	17 June	....	40
Brooman	Purifying oils	....	21 July	19 July	100, 180
Brooman	Presses and pressing	....	....	3 June	120
Brooman	Fibrous and membraneous materials	....	....	4 June	120
Brooman	Manure	10 Aug.	....	....	140
Brooman	Knitting machinery	7 Oct.	....	....	300
Brooman	Sugar	7 Oct.	....	....	300
Brooman	Mowing and reaping machines	14 Oct.	....	....	320
Brown	Preparing and spinning	18 Oct.	....	....	340
Brown and Mackintosh	Paper	....	24 May	21 June	40, 120

Name.	Subject.	England.	Scotland.	Ireland.	Page.
Bruff	Railways and carriages	....	8 July	10 July	99, 120
Brunet	Shipbuilding	....	....	5 Aug.	180
Burn	Steam engines	21 Dec.	6 Oct.	....	520, 380
Burnett	Preserving wood (Extension)	20 July	....	....	81
Burrell and Gibson	Reaping machines	15 July	....	....	60
Carter	Propelling	14 Oct.	....	....	320
Clough	Brushing and cleaning	19 Aug.	....	....	160
Coleman	India-rubber and gutta percha	28 June	....	....	20
Coleman	Railways, engines, and carriages	....	16 June	....	40
Colson	Vehicles	12 Aug.	....	....	140
Coupier and Mellier	Paper	....	....	2 June	100
Crockford	Brewing	....	2 Sept.	7 Sept.	380, 320
Crooker	Paddles	28 June	....	....	20
Crosse	Extracting metals	26 Aug.	....	....	180
Cowper	Building materials	26 Aug.	....	....	180
Crowther	Hydraulic crane	2 Nov.	....	....	379
Dam	Boiler incrustation	28 Aug.	....	....	179
David	Bleaching	....	1 Sept.	....	380
Denton	Preparing cotton	29 July	....	....	99
Denton	Looped and terry fabrics	....	28 Aug.	....	379
Dix	Artificial illumination	7 Aug.	16 Sept.	....	140, 380
Egan	Sugar	20 July	....	....	80
Fairbairn and Horsman	Preparing flax, hemp, &c.	....	....	8 June	100
Fawcett	Carpets	17 July	....	....	79
Field	Transferring and printing	14 Oct.	....	....	320
Fish	Looms	26 Aug.	....	....	180
Fontainemoreau	Cocks and taps	29 July	....	....	99
Fontainemoreau	Kneading and baking bread	....	18 July	....	99
Fontainemoreau	Railways and locomotives	....	21 July	....	100
Fontainemoreau	Cutting schistus	19 Aug.	....	....	180
Fontainemoreau	Producing gas	7 Sept.	....	....	220
Fontainemoreau	Washing, bleaching, and dyeing	7 Oct.	....	....	300
Fontainemoreau	Articles of dress	6 Nov.	....	....	400
Frearson	Cutting and shaping metal	....	14 June	....	40
Fulton	Hats	11 Nov.	14 June	....	400, 40
Galloway	Sugar	21 Dec.	....	....	520
Gaullie	Plastic composition	6 July	....	....	39
Gauntlett	Organs, seraphines, &c.	15 July	....	....	60
Gesswein	Baking and burning clay	6 July	....	....	39
Gorman	Obtaining power	8 Dec.	....	....	480
Gratrix	Producing designs	....	17 June	....	40
Hale and Roberts	Night-lights or mortars	8 July	....	....	60
Hardman	Looms	....	18 Aug.	....	180
Hesketh	Reflecting light	....	22 July	....	100

Name.	Subject.	England.	Scotland.	Ireland.	Page.
Hetherington	Stamping and shaping metals	3 Aug.	....	....	120
Higgin	Bleaching and scouring	....	8 July	....	99
Higgins and Whitworth	Spinning and doubling	6 July	....	....	39
Hind	Weighing machines	7 Aug.	....	....	140
Hindman and Warhurst	Steam generators	....	16 June	8 June	40, 120
Hoblyn	Navigation	28 June	....	....	20
Hodgson	Woven fabrics	30 Sept.	....	....	300
Horton and Wylde	Heating and evaporating	....	12 Oct.	13 Oct.	380, 389
Hornsby	Threshing and riddling machines	3 July	....	....	39
Houldsworth and Houldsworth	Embroidering frames	27 July	....	....	99
Huddart	Cigars	20 July	....	....	60
Hughes	Spinning and weaving	10 Aug.	....	....	140
Hunt	Washing and separating ores	16 July	....	....	79
Hunt	Fire-arms	19 Aug.	18 Sept.	....	160, 380
Hunt	Ammoniacal salts	30 Sept.	....	....	280
Hutchinson	Preparing oils	18 Sept.	....	....	260
Jackson	Artificial light	21 Oct.	....	....	340
James	Heating and refrigerating	3 Sept.	....	....	220
James	Weighing machines	7 Sept.	....	....	220
Jennings	Waterclosets and pumps	23 Aug.	....	....	179
Johnson	Steam-engines	6 July	28 June	....	39, 99
Johnson	Railways and boilers	....	12 July	....	99
Jordan	Disinfecting oils	12 July	....	....	60
Jude	Type	30 Sept.	....	....	280
Kirkham and Kirkham	Gas	22 July	....	....	80
Lamaille	Preserving japanned leather	1 Dec.	....	....	460
Lamb and Menday	Kilns	23 Oct.	....	....	360
Laming	Gas and its products	12 Aug.	18 July	....	140, 99
Lawrence	Brewing apparatus	26 Aug.	....	....	180
Lawson and Lawson	Scutching flax	23 Sept.	....	....	260
Laycock	Tanning and unhairing skins	....	6 July	6 Aug.	99, 220
Lemoinne	Varnish, &c.	6 July	....	....	39
Lester	Treating seeds of flax	30 Sept.	....	....	280
Liddell	Electric telegraphs	11 Nov.	....	....	400
Lillie	Walls, floors, roads, &c.	....	31 Aug.	....	379
Lord	Spinning and heckling	....	2 Sept.	....	380
Losh	Salts of soda	6 July	21 July	....	39, 100
Lowe and Wych	Propelling vessels	19 Aug.	....	....	160
Lusty	Wire fabrics and pins	24 June	....	....	20
McAnaspie	Portland stone, cement, &c.	2 Nov.	....	....	379
McBride	Scutching flax	....	....	4 June	120

Name.	Subject.	England.	Scotland.	Ireland.	Page.
McConnell	Steam engines and boilers	....	18 June	....	40
M'Conochie ..	Locomotives, boilers, &c.	24 June	20 Sept.	....	20, 280
McGavin	Iron for ship-building ..	23 Oct.	21 Oct.	....	360, 380
M'Glashen	Removing houses	....	....	26 May	100
McHenry	Bricks and tiles	20 July	....	....	80
Macintosh	Sugar	18 Sept.	....	....	260
Mackenzie	Jacquard frames........	29 June	....	....	20
Mansell	Railways, rolling-stock, &c.	....	....	21 June	120
Martin	Hoeing	29 July	....	....	99
Mathieu	Aërating liquids........	23 Sept.	....	....	260
Maudslay	Steam-engines	....	21 July	22 July	100, 180
May	Thread and yarn	20 July	....	....	80
Medhurst......	Water-meters	27 Sept.	....	....	289
Mitchell	Purifying tin ores	18 Sept.	....	....	269
Morewood and Rogers ..	Coating metals	....	....	5 Aug.	220
Morewood and Rogers ..	Shaping, coating, and applying metals	....	6 Sept.	....	380
Morgan and Gaskell ..	Candles	24 June	....	....	20
Moride	Tanning	30 Sept.	....	....	280
Murdoch	Woollen fabrics	6 July	....	....	39
Newton	Weaving and marking fabrics	....	15 June	....	40
Newton	Cutting soap	10 July	15 July	....	60, 99
Newton	Separating substances ..	....	23 June	....	99
Newton	Wheels	31 July	3 Aug.	....	119, 180
Newton	Metallic fences	7 Aug.	13 Aug.	....	140, 180
Newton	Steam gauges	11 Oct.	....	....	320
Newton	Railway chairs	19 Oct.	....	....	340
Newton	Sewing machinery	19 Oct.	....	....	340
Newton	Passenger register	19 Oct.	....	....	340
Nichols, Livesey and Wroughton	Textile fabrics	19 Aug.	....	....	160
Nickels and Burrows ..	Weaving	30 Sept.	....	....	280
Palin and Sievier	Brewing and extracting..	19 Oct.	....	....	340
Palm	Baking bricks and tiles..	13 July	....	....	60
Palmer	Candles and lamps	19 Aug.	....	....	160
Parkes........	Separating silver	....	26 Aug.	....	379
Parris	Cutting and shaping cork	....	12 July	22 July	99, 180
Petrie	Electric currents	13 Nov.	....	....	420
Pilling........	Looms	20 Aug.	....	....	220
Pocock	Rendering sea water pure	27 Nov.	....	....	460
Poggioli	Medical compound	26 Aug.	....	....	179
Poole	Reaping and mowing machines..........	6 July	....	....	39
Poole	Boots, shoes, and clogs ..	15 July	....	....	60
Poole	Caoutchouc............	18 Sept.	....	....	260
Poole	Combs	30 Sept.	....	....	280
Poole	Umbrellas and parasols..	27 Nov.	....	....	460
Potter and Smith	Looms and terry fabrics..	6 July	....	....	39
Potter and Smith	Carpets, rugs, &c.......	31 July	6 Aug.	....	119, 180
Pownall	Preparing flax	15 July	28 May	....	60, 40

Name.	Subject.	England.	Scotland.	Ireland.	Page.
Vaudelin	Converting old fabrics ..	30 June	....	....	20
Von Sparre	Separating substances ..	20 July	....	....	80
Wagstaff	Candles	....	....	5 Aug.	180
Walker	Treating cotton-seeds ..	2 Nov.	....	....	379
Wallis	Crushing machinery	24 June	....	....	20
Warden	Carpets	....	31 May	....	40
Warren	Railways, carriages, &c.	....	26 Aug.	17 Aug.	379, 320
Warren and Walker ..	Screws, screw-keys, &c..	18 Sept.	....	....	260
Watt	Treating flax	....	....	15 June	120
Weare	Galvanic batteries	12 Aug.	....	....	140
Weems	Metallic pipes and sheets	11 Nov.	31 May	....	400, 40
Wickens	Motive power	31 July	....	....	119
Wilson........	Cloths	18 Sept.	....	....	260
Wilson........	Manufacturing flax	21 Oct.	....	....	340
Winter	Supplying motion	29 July	....	....	99
Wright	Stoves and grates	....	11 Sept.	....	380

ALPHABETICAL LIST OF NEW PATENTS GRANTED FOR THE UNITED KINGDOM.

Number.	Name.	Subject.	Dated.	Sealed.	Page.
150	Boyd	Finishing woven fabrics	2 Oct.	15 Dec.	355, 500
96	Bridson	Rinsing and washing fabrics ..	1 Oct.	8 Dec.	339, 499
426	Campbell	Finishing fabrics	18 Oct.	8 Dec.	378, 500
115	Carr............	Brick machinery	1 Oct.	22 Dec.	339, 520
279	Clark	Weaving carpets............	6 Oct.	8 Dec.	357, 500
428	Cottam	Quarrying slate	18 Oct.	15 Dec.	378, 500
51	Craddock	Steam-engines and boilers ..	1 Oct.	8 Dec.	338, 499
255	Crook and Wood..	Preserving iron	6 Oct.	8 Dec.	356, 499
475	Currie	Grinding wheat	21 Oct.	15 Dec.	397, 500
174	Duncan	Dyeing cotton	2 Oct.	24 Dec.	417, 520
97	Dunlop	Carriage wheels	1 Oct.	24 Dec.	339, 520
215	Erskine	Felted and cemented fabrics..	4 Oct.	8 Dec.	356, 499
106	Fearn	Ornamenting metallic surfaces	1 Oct.	22 Dec.	339, 520
117	Fell	Ropes, twines, &c...........	1 Oct.	8 Dec.	339, 499
367	Fontainemoreau ..	Silicatisation of calcareous matters	13 Oct.	8 Dec.	377, 500

Number.	Name.	Subject.	Dated.	Sealed.	Page.
502	Graham	Bottles and jars	23 Oct.	18 Dec.	398, 520
463	Harrison	Sizing cotton warps	20 Oct.	18 Dec.	397, 520
380	Hely	Waiter or tray	14 Oct.	15 Dec.	377, 500
88	Holcroft	Steam-engines	1 Oct.	8 Dec.	339, 499
290	Horsfield	Splitting and grinding	7 Oct.	11 Dec.	357, 500
314	Husband	Weaving hat plush	9 Oct.	8 Dec.	357, 500
237	Jäger	Treating cotton in dyeing....	5 Oct.	11 Dec.	356, 500
325	Johnson	Composing & distributing type	9 Oct.	8 Dec.	358, 500
214	Kennedy	Motive power	4 Oct.	8 Dec.	356, 499
331	Laidlaw	Gas-burners	11 Oct.	8 Dec.	358, 500
70	Lakin and Rhodes	Spinning and doubling	1 Oct.	8 Dec.	339, 499
409	Leigh	Carding cotton	16 Oct.	15 Dec.	378, 500
428	Lenox and Roberts	Raising and lowering cables..	18 Oct.	15 Dec.	360, 500
360	Lloyd	Paper	13 Oct.	22 Dec.	377, 520
365	Lloyd	Steam-engines	13 Oct.	24 Dec.	377, 520
103	Lungley	Ship-building	1 Oct.	22 Dec.	339, 520
187	Miller	Finishing fabrics	2 Oct.	8 Dec.	355, 499
81	Osbourn	Wearing apparel............	1 Oct.	11 Dec.	339, 500
95	Oxley	Heating and drying	1 Oct.	18 Dec.	339, 520
304	Paterson	Buckles or fastenings	8 Oct.	8 Dec.	357, 500
285	Pettitt and Forsyth	Spinning and drawing	7 Oct.	24 Dec.	357, 520
370	Pinkney	Cases for marking materials..	13 Oct.	15 Dec.	377, 500
540	Potts	Hinges	27 Oct.	18 Dec.	399, 520
193	Ridley	Cutting and reaping machines	2 Oct.	15 Dec.	355, 500
425	Roberts	Stopping and lowering cables..	18 Oct.	15 Dec.	360, 500
128	Rogers	Studs, buttons, &c.	1 Oct.	22 Dec.	339, 520
151	Sharp	Combing and drawing a sliver	2 Oct.	8 Dec.	355, 499
78	Smith	Cleaning currants	1 Oct.	11 Dec.	339, 500
79	Smith	Reaping machine	1 Oct.	11 Dec.	339, 500
364	Smith	Weaving and printing	13 Oct.	8 Dec.	377, 499
77	Soulby	Letter-press printing........	1 Oct.	11 Dec.	339, 500
404	Stevenson	Weft forks for looms........	15 Oct.	18 Dec.	378, 520
369	Suttie	Roasting apparatus	13 Oct.	8 Dec.	377, 500
603	Thomson	Carpets	1 Nov.	18 Dec.	418, 520
294	Thompson	Artificial light	7 Oct.	8 Dec.	357, 500
112	Turck	Packing goods	1 Oct.	22 Dec.	339, 520
396	Turck	Propelling vessels..........	15 Oct.	22 Dec.	378, 520
80	Walker	Ash-pan	1 Oct.	11 Dec.	339, 500
407	Waring	Working & quarrying coal, &c.	15 Oct.	11 Dec.	378, 500
188	Weems	Obtaining and applying power	2 Oct.	8 Dec.	355, 499
550	Wormald	Roving, spinning, and doubling	28 Oct.	24 Dec.	418, 520
190	Young	Dental operations	2 Oct.	8 Dec.	355, 499
309	Yule	Sawing machinery	8 Oct.	22 Dec.	357, 520

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TO THE FIFTY-SEVENTH VOLUME.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1508.] SATURDAY, JULY 3, 1852. [Price 3*d*., Stamped 4*d*.

Edited by J. C. Robertson, 166, Fleet-street.

LAKE'S PATENT SYSTEM OF CANAL NAVIGATION.

Fig. 1ª.

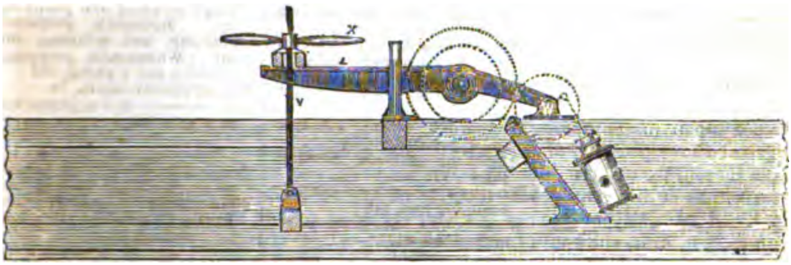


Fig. 2ª.

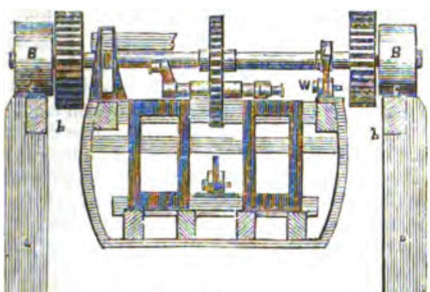
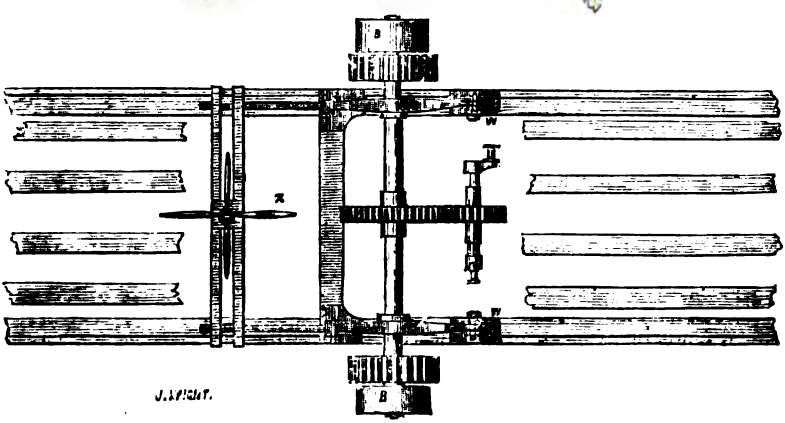


Fig. 3ª.



LAKE'S PATENT SYSTEM OF CANAL NAVIGATION.

(Patent dated December 8, 1851. Patentee John Lake, of Apsley, Esq., C.E. Specification enrolled June 8, 1852.)

Specification.

My improvements in propelling boats and barges on canals and rivers have for their object; First, the employment of steam power in lieu of horse power to drag the said boats and barges; Secondly, the dispensing with the steersmen, who are now required for every boat or barge; Thirdly, the substitution of an inclined plane of a peculiar construction for the existing canal locks: by which several means combined, all the lockage water now required will be saved, and the expenses of haulage and maintenance of the canal works will be considerably diminished.

The manner in which I propose to effect these desirable objects is exhibited in the accompanying engravings.

Fig. 1 shows the plan of a canal with the alterations and additions requisite to be made therein for carrying out my improved system of propulsion. Figs. 2, 3, and 4 are sections at different points illustrative of the mode of construction shown in fig. 1. A trackway or railway TT (for the boats to run upon or between) is laid upon piles *a, a, a,* sunk into the bed of the canal; that is to say, within the present waterway. The piles are in two parallel rows, about 9 feet apart, with intervals between them (in the longitudinal direction) of about 15 feet. *bb* are the horizontal walings or rails which are laid on the top of these piles above the water level, and firmly bolted thereto. *c* is a thin strip of iron, which is superposed on the upper surface of these rails or walings, and screwed to them with counter-sunk screws or spikes.

In figs. 1 and 3 only a single trackway is supposed to be employed; but there may be two such trackways, as shown in fig. 4, or as many as the width between bank and bank will admit of. Or instead of two lines of rails within the water area, there may be one line of rails formed within the water area, as in figs. 1 and 3, and another laid down along either bank, either upon piles driven therein, or upon ballast and sleepers in the usual way of constructing railways on land. The depth to which the piles *a, a, a,* will require to be driven, will of course depend on the nature of the ground forming the bed of the canal or river. The height also of the horizontal walings *b b* above the water may be raised to suit circumstances, but need not in general be more than about 18 inches above the usual high-water mark. In cases where the bed of the canal or river is composed of rock or hard material into which piles cannot be driven by the ordinary methods, I propose either to drill or bore holes for their reception; or I support them by means of framework. Framework of a similar description may be also employed for carrying the trackway over aqueducts, or high embankments, or other parts where the driving of piles would be objectionable or difficult. These trackways may have the same bends or curves as the canal or river itself. In all cases I propose to make the width of the trackways in canals or rivers two or three feet wider than the greatest width or beam of the boats or barges used.

The mode in which I contemplate employing steam power for propelling trains of boats in these trackways is as follows:—I propose that the first boat in a train shall contain a steam-engine with its boiler, fuel, and all other necessary appliances; and that the steam-engine shall give motion to a pair of driving wheels BB, either directly from a crank-shaft, or by means of intermediate wheel-gearing. The rims of these driving-wheels, which will be of considerable width, will rest on the iron strips *c c,* which are screwed upon the horizontal walings *b b.* To the shaft of the driving wheels are attached two levers L L, (figs. 1^a, 2^a, and 3^a,) which are movable on the centres, W W, and connected at their ends by a transverse beam or beams; and these levers can be raised or lowered as may be required by means of the screw Y and handle X.

Now, if we suppose the driving wheels to be resting on the rails *b b,* and the handle to be turned so as to depress the ends of the levers, it is plain that, as the rails *b b* form an unyielding fulcrum, the screw Y, which is firmly attached to the bottom of the boat, will have a tendency to raise the boat and the weight in it out

of the water; and if this tackle were sufficiently powerful, the boat might be raised entirely out of the water, and its whole weight be made to rest on the driving-wheels

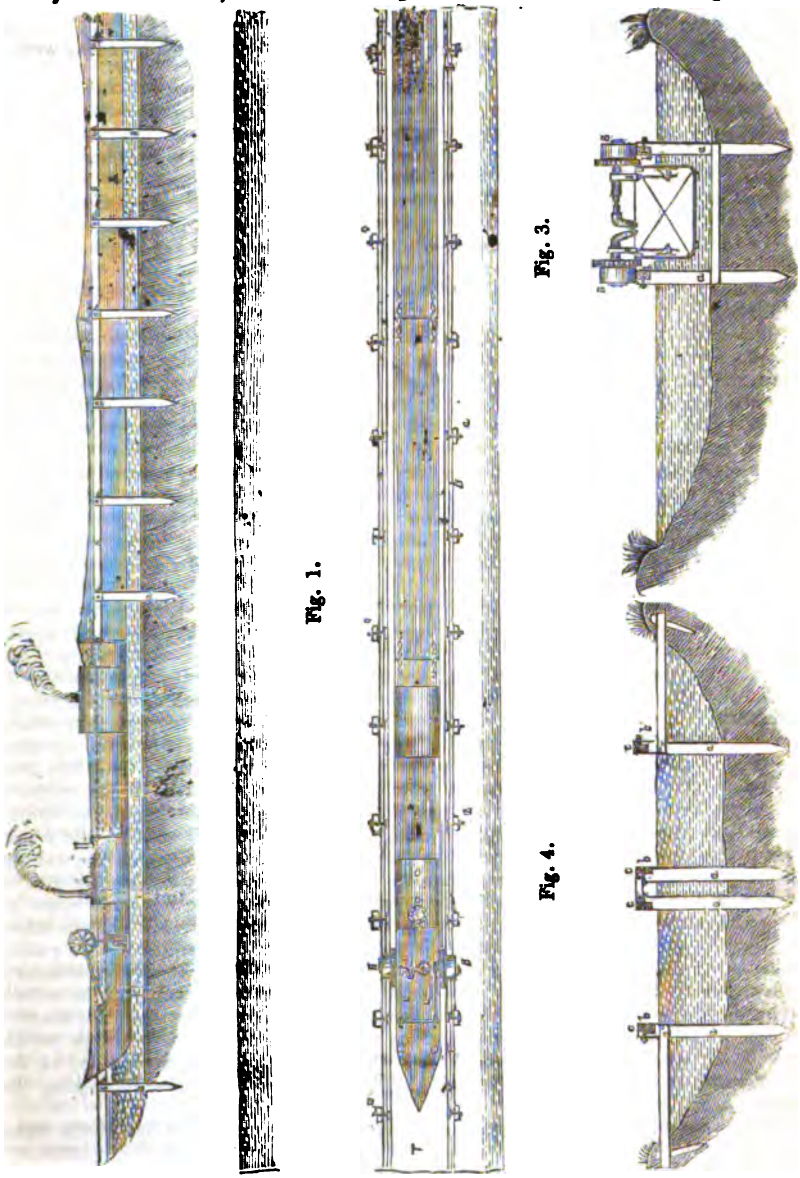


Fig. 2. Fig. 1. Fig. 3. Fig. 4.

and horizontal rails. The driving-wheels, however, may be made to press with any degree of force required on the rails *b b*. The degree of pressure which would require to be brought upon them would depend on the resistance to be overcome, or load to be dragged. In ordinary cases, a weight of five or six tons would be all that would be required.

Now if the driving wheels, when pressed down upon the rails with the required degree of force, are made to revolve by means of the steam engine with which they are connected, it is plain that so long as no slipping takes place between the wheels and the iron strip, motion will be given to the boat and to the whole train attached to it.

In navigating canals or rivers according to this system, I prefer boats constructed as shown in the engravings, for the following among other reasons:—They would be cheaply constructed in the first instance, as no steersmen being required, no cabins would be needed; they would have the same room for stowage as the existing canal boats within a less superficial area; they could be propelled backwards almost as easily as forwards; and as they would be coupled up nearly close to each other, the resistance from the water would be considerably less in a long train than if propelled separately and independently of one another. The existing boats could also be converted into vessels of the above description at a small cost; or, should it be preferred, the same boats as are now in use might be continued with a slight alteration.

It is plain that no loss of power would be incurred in propelling boats by steam on this plan; for so long as there was no slipping of the driving wheels upon the rails, the effect would be precisely analogous to the mode of propelling carriages on the ordinary land railways; whereas, in every case in which the water of the canal itself is used as the fulcrum of motion, as in propelling by paddle-wheels or the screw, full three-fourths of the power of the engine is lost by the "slip."

As the resistance opposed to the motion of canal boats through water at a speed of two or three miles per hour is exceedingly small, and as no steersmen will be required, an engine of small power, used in the manner I propose, will be enabled to drag very long trains of boats at a minimum of cost; and this being the case, a single trackway would be sufficient to carry the traffic of any of the existing canals in Great Britain.

It would, of course, be necessary to provide at certain intervals along the line of the canal or river, passing-places or sidings, to enable trains of boats going in opposite directions to meet and pass each other. Fig. 6 shows a plan of a passing-place for this purpose.* It consists, in fact, of a double line, with an opening at each end, so that a train may enter or leave either side in the manner shown in the engraving. One train is here shown as waiting for another coming in the opposite direction. On the latter arriving at A, the engine would cease propelling, and as the opening to allow of its passage to the other line of rails is not more than forty or fifty feet in length, the momentum which the train had acquired previous to the engine's ceasing to work will be sufficient to cause it to carry it some distance into the siding, or until the driving wheels are again resting upon the rails. As soon as the whole of this train has entered the siding, then the first-mentioned train, which was waiting in the other trackway, would start again on its journey, and the momentum of this train would in like manner be sufficient to carry the engine over the open space at the entrance to the siding. With two trackways, one for the "up," and the other for the "down" traffic, these sidings of course would not be required. To enable boats to lay along side wharfs on the line of the canal or river, it will be necessary to leave an opening in the rails of a length sufficient to enable a boat to be moved in or out of the trackways; and as this in no case can exceed fifty feet, the absence of that length of rails would not cause any stoppage of the through trains, which would not require to stop at the wharfs where these openings are made, as the momentum of the train would be amply sufficient to carry the boat containing the engine over the openings.

Boats may thus be left or picked up at any required part on the line of the canal or river with the greatest facility.

In all the preceding arrangements it has been assumed that the canal or river is not encumbered with locks; but as this is but rarely the case, provision must be made for an opposite state of things.

(To be continued in our next.)

* This figure will be given in our next Number.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—When I remarked, in a former Number of this Journal, that the Exciseman's Staff Question "appeared to me to be open to further discussion," I must say that nothing was further from my intention than to wound the scientific pride and self-esteem of your correspondent, Mr. Tebay; and had I foreseen that what I ventured to advance on that interesting mechanical problem could have created the slightest irritation in any one, I should, no doubt, have been silent upon the subject.

For aught I know, Mr. Tebay may be a very able mathematician; judging, indeed, from the ease, elegance, and accuracy of his analysis, as displayed in pp. 345 and 346, vol. lvi., perhaps a competent umpire should be disposed to award him a niche amongst our standard mechanical writers. However this may be, as I disclaim all pretensions to being a mathematician, and as the little I have read of the science has been strictly with a view to its useful application, there would be nothing very surprising in finding in the calculations of a practical man some slight deflections from the rigid forms of the science, although such might not affect any final result.

The question of the Exciseman's Staff, divested of the consideration of *friction*, contains but little either curious or useful to engage the attention of even the theorist, much less that can interest those whose scanty time for study must necessarily be devoted to questions likely to arise in the pursuits of a profession. Viewed, however, in *connection with friction*, the question loses its mere ideal character, becomes identified with the material realities of life, and takes its place among the actual applications of science in constructive art. It would be easy to point out many particular applications of the mechanical principle of friction in respect to equilibrium which this question involves;—they are to be found in all our machines, in most of our architectural structures, and particularly in the problem of correctly apportioning the capacity, buoyancy, and weight of self-acting sluices provided for the drainage of lands reclaimed from the sea.

Now as regards the special matter between Mr. Tebay and myself, as he has insisted upon my saying something further, I shall, with your kind permission, "*relax my premature determination*," and gratify him in this respect. His solution is given in page 346 as a general solution of the question, taking in, of course, friction and all the influential elements of the case. He will pardon me for expressing a doubt that it is any such thing. If the numerical calculation be correct, his solution holds good for one particular case, that is, when the cylinder is upon the point of "*slipping*" *downwards*, although he has not even noted that circumstance. Now if Mr. Tebay denies that the cylinder *might have been* upon the point of "*slipping*" *upwards*, let him state so at once, and thus end the discussion with me, as I shall, in that event, bow in silence to his *dictum*, and leave the verdict to your readers. But if he do not deny this principle, how is his solution to be considered general when it overlooks *two* out of *three* possible conditions of the question?

In the foregoing remarks, I have distinguished the word "*slipping*," as extracted from Mr. Tebay's solution, because it fixes the particular kind of friction he was then considering. In his letter, page 444, *ante*, he abandons this idea, and supposes the cylinder to be "*connected to the edge of the vessel by a hinge*." Now I must observe that this sudden change of venue—a change which completely ignores the essential conditions upon which his own solution is founded—appears to me, at least, very inconsistent, if not something more. He goes on to say, "*it is not necessary to take into account the pressure on the hinge!*" Ah, Mr. Tebay, why did you say that? How, then, could the resultant be equal to zero? Is not the pressure on the hinge *one* of the pressures of the system? "In the course of your long experience has it ever been your good fortune to have stumbled upon" any case of *equilibrium* in which one of the pressures was thus conveniently got rid of? Were you aware of that singular "novelty in mechanics" which indicates a material difference between the friction of "*slipping*," the friction of *rolling*, and the friction of *an axle?* Were you aware that the substitution of a hinge

unsuited your own expression,

$$\tan. \beta = \mu,$$

which can apply only to the friction of "slipping?" If aware of all this, it is only natural to believe you would have seen that the supposition of the hinge creates a new case, entirely distinct from that to which your "general" solution has been addressed, which, in express words, assumes the friction of "*slipping*." Verily, it would appear that Coulomb, Morin, and our own Moseley, have written for some people in vain.

Should Mr. Tebay condescend to notice these remarks, I must request that as his "general" solution is founded upon the supposition that the cylinder is in *one* of the states bordering on notion, he will distinctly affirm or deny whether there is not another state bordering upon motion in which the body might have been; and whether those two states, the *superior* and *inferior*, will not necessarily arise in that particular case of friction which he has supposed. I can hardly conceive that Mr. Tebay will question this principle or its application in the present instance. We shall then have three forces in equilibrium; namely, one derived from the weight of the body, another from the buoyancy upon it, and the resistance at the fixed point P. That there may be no mistake upon this point, I shall quote Mr. Tebay's own words. "*Now when the staff is just on the point of slipping, the friction* ($P\mu$) *between the staff and the edge of the vessel together with the direct buoyancy in* (4), *must be equal to the weight of the staff resolved in the direction of its length*," (p. 346, *ante*). Here, now we have the whole case in a nutshell. A number of forces are in equilibrium, *one* of which is a *resistance* supplied by a fixed surface, *another* derived from the weight of the body which *is unknown*, and it is an established principle in the theory of statical resistances, that under such circumstances the conditions of equilibrium are indefinite unless *all* the forces save *that resistance* be known; that any, or all of the forces may be infinitely varied without communicating motion; and hence it follows that the *weight of the body* cannot be determined from such a state of equilibrium, but may be infinitely varied within certain limits dependent upon that single resistance which enters into the system.

Now this is the "mechanical principle," which I regard as of some value to persons who have to deal with the substance, and not with the shadow of things. Mr. Tebay and his sneering friend "Mechanicus," may continue to deride it, and content themselves with taking exceptions to minor details; but others besides myself may be disposed to think that, as gentlemen who aspire to be ranked amongst the mathematicians of our day, it would have been more creditable to their heads to have pointed out the impossibility of any *correct* solution than to have attempted to foist a delusion on the readers of this Magazine.

As respects the symbol F, equation (3), in my investigation, it will be seen that I avoided giving it any specific interpretation, that equation being intended as a mere type rather than a precise expression of quantities. I am not, however, prepared to maintain that it is free from the exceptions taken to it, or that there has not been an oversight in the form adopted; but that expression does not in the least affect the ultimate object, which was to show that, under the assigned conditions, the weight W was indeterminate. The following equation expresses precisely the same thing in a form which may be less objectionable, although it is probable the limits will be found to be considerably wider:-

$$B.\sin\theta \pm W.\frac{(b-a).\cos\theta.\sin\theta}{b.\cos\theta + r.\sin\theta} = W.\sin\theta;$$

in which the first term is the buoyancy resolved in the direction of the axis, the second term the resistance of the surface, and the third term the component of the weight in a direction opposite to the first term; the quantities being those used in p. 404, *ante*.

The Exciseman's Staff, Sir, has occupied the minds of able and distinguished men of science; I am not so presumptuous as to suppose that they were wrong in the peculiar views they may have taken of the question. I have looked at it in a practical light, and strictly with reference to the influence of resistance upon the equilibrium. I feel satisfied that one of your *real* mathematical correspondents would in less han five minutes lay this ghost of discord for ever. Should you think proper to act upon this suggestion, and give the deci-

sion of any one whom you may deem an *authority*, I for one shall be amply satisfied as I am sure to profit by the result whatever that may be. The enunciation to be that given in p. 346 (No. 1499) of this Journal.*

I am, Sir, yours, &c.,
T. SMITH.

Bridgetown, Wexford, June 23, 1852.

METHEMATICAL PERIODICALS.

(Continued from vol, lvi., p. 447.)

XXVII. — *The Mathematical Repository.—Original Papers Continued.*

Art. I. Part II. Vol. V. On the composition of Forces. By Mr. Thomas Knight, of Papcastle.

Art. II. Three Indeterminate Problems. By Mr. James Cunliffe.

Problem 1.

To find three right-angled triangles, such, that their perimeters may be equal to each other, and their areas in arithmetical progression.

Problem 2.

To find any number of numbers, *ad libitum*, such, that if their sum be either added to, or subtracted from the square of each particular number, the several results shall all be rational squares.

Problem 3.

To find any number of fractions, *ad libitum*, such, that if the sum of their cubes be either added to, or subtracted from the square of each particular fraction, the several results shall all be rational squares.

Art. III. Mathematical Scraps. By Mr. Thomas White.

(1.) On the Transformation of Equations; and (2.) of slowly converging series into others that shall have their coefficients arbitrarily assumable as given or known.

Art. IV. Horæ Arithmeticæ. By W. G. Horner, Esq., of Bath.

No. I. On Numerical Equations.

No. II. On Initial Solutions.

No. III. Abbreviations of the Initial Solutions.

* We have, agreeably to the suggestion of our esteemed correspondent, requested one of the very ablest of our mathematical contributors to take the matter in hand, and to favour us with his decision upon it.—ED. M.M.

Art. V. [Horner's claims to the discovery of his method of Solving Numerical and other Equations in opposition to the statements of Holdred and Nicholson.] Letter from Mr. W. G. Horner.

Art. VI. Horæ Arithmeticæ. By W. G. Horner, Esq.

No. IV. Extremely simple Theory of Transformation.

No. V. Third Stage of Solution.

No. VI. The same subject concluded. *Final Improvement in the third stage of Solution.*

No. VII. Supplementary. Synthetic Division: its conformity with Multiplication and its use in equations. Reciprocal Equations.

[The whole of this series of papers was designed to illustrate what are now appropriately termed "*Horner's Processes*," as partially developed in the original paper printed in the *Philosophical Transactions* for 1819. Mr. Horner remarks, that "the investigation is there conducted on the strictly universal principle," and hence "preceptive details were not deemed necessary," but "in the present essays," these "will be supplied," and such "parts of the theory and practice of the *new* method which peculiarly regard *finite equations*" will be presented "in as succinct and perspicuous a form as possible . . . . . accompanied with such improvements as a more intimate consideration of the subject has suggested." No. I. treats of the Transformation of Equations, in which Problems I. and II. are devoted to finding "the coefficients of the equation, whose roots are less or greater by 1 than those of a given equation of n dimensions." Problem III. *generalises* the preceding by determining the coeffiecients by a uniform process "when the roots of the transformed, are to be less than those of the given equation, by any assigned quantity r." Problem IV. considers the case "when the roots of the transformed, are to be less, or greater, than the *reciprocals* of those of the given equation, by unity or r," and the paper concludes with two "*criteria of possibility*," the first of which "is a particular case of a general theorem due to DE GUA; and the second is an improvement on BUDAN'S criterium," as originally given in the *Nouvelle Méthode*, page 37. No. II. commences with some general remarks on criteria of possibility, and then pro-

ceeds to Initial Solutions. In the introductory remarks, Mr. Horner replies to several "strange misrepresentations," which Mr. Nicholson had "made of the Method of Continuous Approximation," when treating of the same subject in his "Essay on Involution and Evolution." Problem V. is a continuation of the preceding processes, and finds "a limit greater than the greatest root of an equation," which the author conceives to be "the most natural transition to the *new* method," and is merely a translation "of Newton's rule and example into its algorithm." This process prepares the way for Problem VI., which contains full directions for obtaining "the complete initial solution of a numerical equation." Problems VII., VIII., and IX. contain improvements upon "LAGRANGE's method of obtaining the absolute terms of the transformed equations," which is pronounced by Professor Davies (*Ladies' Diary*, 1838, page 69,) to be a "beautiful substitute" for the process contained in "Addendum I." to Mr. Horner's original paper. The "*Horæ*" are interrupted at this stage by a "Letter from Mr. W. G. Horner," dated "Bath, 20th January, 1821," which contains a vindication of his claims to the *independent* discovery of his method of "Continuous Approximation," and which was rendered necessary by the crude statements on the subject contained in Nicholson's "Essays on Involution and Evolution," already referred to. Mr. Horner's letter furnishes a satisfactory proof of independent discovery, and is an exceedingly valuable document in the History of the Problem of Evolution. So far as the processes are concerned, most of them have since been embodied in the writings of Professors Young, Davies, and De Morgan; the last of whom has very ably disposed of the preceding controversy in favour of Mr. Horner, in a series of interesting papers published in the "Companion to the Almanack" for 1839, and in the "Penny Cyclopædia" and "Supplement," under the head of "Involution." No. IV. of the "Horæ" contains an "extremely simple Theory of Transformation," deduced from principles, "quite intelligible to the youngest algebraist." Mr. Horner here discards the "intervention of figurate numbers," and substitutes the property, "that if any expression in terms of x, be divided n times successively, by $x-r$; the remainders in the order they arise, being $l, k, h, \ldots . c, b$; and a the quantity left undivided; then will this transformed expression in $x-r$, viz., $a(x-r)^n+b(x-r)^{n-1} \ldots\ldots +h(x-r)^2+k(x-r)+l$, be exactly equivalent to the *original* expression in x." A verbal rule is hence deduced, which "differs in enunciation only from the text of Problem III. of these essays; and like it, is a strict verbal interpretation of the Theorem in Art. 14 of the original essay in the *Philosophical Transactions* for 1819." The principal portion of this paper appears to have been written in June, 1821, but was not printed in the *Repository* until 1827. In "March 1827," Mr. Horner added a paragraph or two to the original paper, illustrative of what has since been termed "Synthetic Division;" giving two examples of the process from which the verbal directions given in the *Ladies' Diary* for 1838, p. 72, may readily be deduced. The process itself, so far as division by $x \pm a$ and the use of "Detached Coefficients" are concerned, had been previously given by Garnier in 1811, and by Francœur in 1819, but the full development of the method in connection with the solution of equations was reserved for Mr. Horner. No. V. is devoted to a consideration of the "Third Stage of Solution," in which he proposes "to show by rules and examples the efficacy of the *new* principles in *improving old methods* of solution." His *first* example is "*the Ordinary* (Newton's or Raphson's) *Approximation improved;*" the *second* is "*the Method of Double Position improved;*" the *third* considers "*Halley's and other Methods;*" the *fourth*, "*Budan's Supplementary Method;*" and the *fifth*, "*Holdred's Method, as arranged by Nicholson; with an improvement.*" In No. VI. he continues the same subject, and effects a "final improvement in the Third Stage of Solution." It is here shown that "by the *very process of solving* an equation according to this method, it actually is *depressed one degree,*" the truth of which is illustrated by the complete solution of several of Newton's and Nicholson's examples. The consideration of "*equal roots;*" "*roots whose differences are small,*" and "*roots* otherwise *related,*" follow in order, all of which

are exemplified by means of appropriate examples. No. VII. is a "Supplementary" Horæ, principally devoted to "Synthetic Division" and "its use in Equations;" several infinite series and expansions are introduced to evince its power in developing complicated expressions, and "its conformity with Multiplication" is illustrated by two examples from the *Mathematical Companion*, which Mr. Nicholson had solved by the method of Combinations. Mr. Horner concludes his series of Essays and this paper, by giving a "General Rule" for the solution of "Reciprocal Equations," which he considers "will be better understood, and more easily solved, than by the methods now in use." Its application is shown by a complicated example from Bonnycastle's *Algebra*, vol. i., p. 183; and the author remarks, that "binomial equations" may be either treated by the above Rule, or by a separate rule easily modified upon it.]

Art. VI. and IX. Investigations of Geometrical Porisms. By Thomas Galloway, M.A., R. M. College.

[These two papers are continuations of each other, and contain an application of *co-ordinate* geometry to Propositions 61, 62, 63, 64, of Dr. Stewart's "*General Theorems*." So far as I am aware, these are the *only* solutions ever given to these Porisms, "although," as Mr. Galloway observes, "the *General Theorems* have occupied the attention of several distinguished Mathematicians." Previously to the appearance of this paper the ordinary principles of Algebra had probably been applied to the investigation of Porisms by Professor Playfair, in the promised continuation of his "Investigation" in the "*Edinburgh Transactions*, and by several others in our mathematical periodicals, but it does not appear that Mr. Galloway had *any predecessor*, in this country, who had successfully applied the co-ordinate method to this curious and difficult subject. In the Analysis of these Porisms the usual rectangular axes are assumed and the resulting co-ordinate values of the lines, &c., determined; the corresponding equations of the Porismatic properties are then formed, and since these hold *generally* "independently of x and y," the coefficients are put "separately equal to each other." The solution of these conditional equations determines the relations amongst the known quantities of the Porisms, and from these Mr. Galloway very elegantly deduces the requisite *Geometrical* constructions. Several defects in Dr. Stewart's *enunciation* of these Theorems are pointed out in the course of the investigations, as well as their connection with each other and to Proposition 60, which had been considered and extended by Mr. Ivory in the first volume of the New Series of the "Repository." The student will not regret the time devoted to a careful consideration of these valuable and elaborate discussions.]

Art. VII. An Extension of a Theorem in the Doctrine of Central Forces. By the Rev. C. Ffrench Bromhead.

Art. VIII. On the Solution of Equations. By the Rev. S. Hawkes, Trinity College, Cambridge.

[After the improvements made by Mr. Horner, this paper would attract but little attention, its principal object being the determination of the integral or fractional roots of equations by means of a series of trials and the aid of Synthetic Division.] T. T. W.

Burnley, Lancashire, June 24, 1852.

THE NEW PATENT LAW AMENDMENT ACT.

July, 1852.

Whereas it is expedient to amend the law concerning letters patent for inventions, Be it enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

I. The Lord Chancellor, the Master of the Rolls, her Majesty's Attorney-general for England, her Majesty's Solicitor-general for England, the Lord Advocate, her Majesty's Solicitor-general for Scotland, her Majesty's Attorney-general for Ireland, and her Majesty's Solicitor-general for Ireland, for the time being respectively, together with such other person or persons as may be from time to time appointed by her Majesty, as hereinafter mentioned, shall be Commissioners of patents for inventions; and it shall be lawful for her Majesty from time to time, by warrant under her royal sign manual, to appoint such other person or persons as she may think fit to be a Commissioner or Commissioners as aforesaid; and every person so appointed shall continue such Commissioner during her Majesty's pleasure; and all the powers hereby vested

in the Commissioners may be exercised by any three or more of them, the Lord Chancellor or Master of the Rolls being one.

II. It shall be lawful for the Commissioners to cause a seal to be made for the purposes of this Act, and from time to time to vary such seal, and to cause to be sealed therewith all the warrants for letters patent under this Act, and all instruments and copies proceeding from the office of the Commissioners, and all courts, judges, and other persons whomsoever, shall take notice of such seal, and receive impressions thereof in evidence, in like manner as impressions of the Great Seal are received in evidence, and shall also take notice of and receive in evidence, without further proof or production of the originals, all copies or extracts certified under the seal of the said office, of or from documents deposited in such office.

III. It shall be lawful for the Commissioners from time to time to make such rules and regulations (not inconsistent with the provisions of this Act) respecting the business of their office, and all matters and things which under the provisions herein contained are to be under their control and direction, as may appear to them necessary and expedient for the purposes of this Act; and all such rules shall be laid before both Houses of Parliament within fourteen days after the making thereof, if Parliament be sitting, and if Parliament be not sitting, then within fourteen days after the next meeting of Parliament; and the Commissioners shall cause a report to be laid annually before Parliament of all the proceedings under and in pursuance of this Act.

IV. It shall be lawful for the Commissioners of her Majesty's Treasury to provide and appoint from time to time proper places or buildings for an office or offices for the purposes of this Act.

V. It shall be lawful for the Commissioners, with the consent of the Commissioners of the Treasury, from time to time to appoint for the purposes of this Act such clerks and officers as the Commissioners may think proper; and it shall be lawful for the Commissioners from time to time to remove any of the clerks and officers so appointed.

VI. Every petition for the grant of letters patent for an invention, and the declaration required to accompany such petition, shall be left at the office of the Commissioners, and there shall be left therewith a statement in writing, hereinafter called the provisional specification, signed by or on behalf of the applicant for letters patent, describing the nature of the said invention; and the day of the delivery of every such petition, declaration, and provisional specification shall be recorded at the said office, and endorsed on such petition, declaration, and provisional specification, and a certificate thereof given to such applicant or his agent; and all such petitions, declarations, and provisional specifications shall be preserved in such manner as the Commissioners may direct, and a registry thereof and of all proceedings thereon kept at the office of the Commissioners.

VII. Every application for letters patent made under this Act shall be referred by the Commissioners, according to such regulations as they may think fit to make, to one of the law officers.

VIII. The provisional specification shall be referred to the law officer, who shall be at liberty to call to his aid such scientific or other person as he may think fit, and to cause to be paid to such person by the applicant such remuneration as the law officer shall appoint; and if such law officer be satisfied that the provisional specification describes the nature of the invention, he shall allow the same, and give a certificate of his allowance, and such certificate shall be filed in the office of the Commissioners, and thereupon the invention therein referred to may, during the term of six months from the date of the application for letters patent for the said invention, be used and published without prejudice to any letters patent to be granted for the same, and such protection from the consequences of use and publication is hereinafter referred to as provisional protection: provided always, that in case the title of the invention or the provisional specification be too large or insufficient, it shall be lawful for the law officer to whom the same is referred to allow or require the same to be amended.

IX. The applicant for letters patent for an invention, instead of leaving with the petition and declaration a provisional specification as aforesaid, may, if he think fit, file with the said petition and declaration an instrument in writing under his hand and seal (hereinafter called a complete specification), particularly describing and ascertaining the nature of the said invention, and in what manner the same is to be performed, which complete specification shall be mentioned in such declaration, and the day of the delivery of every such petition, declaration, and complete specification shall be recorded at the office of the Commissioners, and endorsed on such petition, declaration, and specification, and a certificate thereof given to such applicant or his agent, and thereupon, subject and without prejudice to the provisions hereinafter contained, the invention shall be protected under this Act for the term of six months from the date of the application, and the applicant shall have during such term of six months the like

powers, rights, and privileges as might have been conferred upon him by letters patent for such invention, issued under this Act, and duly sealed as of the day of the date of such application; and during the continuance of such powers, rights and privileges under this provision, such invention may be used and published without prejudice to any letters patent to be granted for the same; and where letters patent are granted in respect of such invention, then in lieu of a condition for making void such letters patent in case such invention be not described and ascertained by a subsequent specification, such letters patent shall be conditioned to become void if such complete specification, filed as aforesaid, does not particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed; and a copy of every such complete specification shall be open to the inspection of the public, as hereinafter provided, from the time of depositing the same, subject to such regulation as the commissioners may make.

X. In case of any application for letters patent for any invention, and the obtaining upon such application of provisional protection for such invention, or of protection for the same, by reason of the deposit of a complete specification as aforesaid in fraud of the true and first inventor, any letters patent granted to the true and first inventor of such invention shall not be invalidated by reason of such application, or of such provisional or other protection as aforesaid, or of any use or publication of the invention subsequent to such application, and before the expiration of the term of such provisional or other protection.

XI. When any invention is provisionally protected under this Act, or protected by reason of the deposit of such complete specification as aforesaid, the Commissioners shall cause such provisional protection or such other protection as aforesaid to be advertised in such manner as they may see fit.

XII. The applicant for letters patent, so soon as he may think fit after the invention shall have been provisionally protected under this Act, or when a complete specification has been deposited with his petition and declaration, then so soon as he may think fit after such deposit, may give notice at the office of the Commissioners of his intention of proceeding with his application for letters patent for the said invention, and thereupon the said Commissioners shall cause his said application to be advertised in such manner as they may see fit; and any persons having an interest in opposing the grant of letters patent for the said invention shall be at liberty to leave particulars in writing of their objections to the said application at such place, and within such time, and subject to such regulations as the Commissioners may direct.

XIII. So soon as the time for the delivery of such objections shall have expired, the provisional specification, or complete specification (as the case may be), and particulars of objection (if any) shall be referred to the law-officer to whom the application has been referred.

XIV. It shall be lawful for the law-officer to whom any application for such letters patent is referred, if he see fit, by certificate under his hand, to order by or to whom the costs of any hearing or inquiry upon any objection, or otherwise in relation to the grant of such letters patent, or in relation to the provisional (or other) protection acquired by the applicant under this Act, shall be paid, and in what manner and by whom such costs are to be ascertained; and if any costs so ordered to be paid be not paid within four days after the amount thereof shall be so ascertained, it shall be lawful for such law-officer to make an order for the payment of the same, and every such order may be made a rule of one of Her Majesty's superior courts at Westminster or Dublin, and may be recorded in the books of council and session in Scotland to the effect that execution may pass there in common form.

XV. It shall be lawful for such law-officer, after such hearing, if any, as he may think fit, to cause a warrant to be made for the sealing of letters patent for the said invention, and such warrant shall be sealed with the seal of the Commissioners, and shall set forth the tenor and effect of the letters patent thereby authorised to be granted, and such law-officer shall direct the insertion in such letters patent of all such restrictions, conditions, and provisoes as he may deem usual and expedient in such grants, or necessary in pursuance of the provisions of this Act; and the said warrant shall be the warrant for the making and sealing of letters patent under this Act according to the tenor of the said warrant; provided always that the Lord Chancellor shall and may have, and exercise such powers, authority, and discretion in respect to the said warrant, and the letters patent therein directed to be made under this Act, as he now has and might now exercise with respect to the warrant for the issue under the Great Seal of letters patent for any invention, and with respect to the making and issuing of such letters patent; and the writ of *scire facias* shall lie for the repeal of any letters patent issued under this Act, in the like cases as the same would lie for the

repeal of letters patent which may now be issued under the Great Seal.

XVI. Provided also, That nothing herein contained shall extend to abridge or affect the prerogative of the Crown in relation to the granting or withholding the grant of any letters patent; and it shall be lawful for Her Majesty, by warrant under Her Royal sign manual, to direct such law-officer to withhold such warrant as aforesaid, or that any letters patent for the issuing whereof he may have issued a warrant as aforesaid shall not issue, or to direct the insertion in any letters patent to be issued in manner herein provided of any restrictions, conditions, or provisoes which Her Majesty may think fit in addition to or in substitution for any restrictions, conditions, or provisoes which would otherwise be inserted therein under this Act; and it shall also be lawful for Her Majesty, by like warrant, to direct any complete specification which may have been filed under the provision herein-before contained, and in respect of the invention described in which no letters patent may have been granted, to be cancelled, and thereupon the protection obtained by the filing of such complete specification shall cease.

XVII. All letters patent for inventions granted under the provisions hereinbefore contained shall be made subject to the condition that the same shall be void, and that the powers and privileges thereby granted shall cease and determine, at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three and seven years respectively, the sum or sums of money and stamp duties in the schedule to this Act annexed; and the payment of the said sums of money and stamp duties respectively shall be indorsed on the warrant for the said letters patent; and such officer of the Commissioners as may be appointed for this purpose shall issue under the seal of the Commissioners a certificate of such payment, and shall indorse a receipt for the same on any letters patent issued under the authority of the said warrant; and such certificate, duly stamped, shall be evidence of the payment of the several sums respectively.

XVIII. The Commissioners, so soon after the sealing of the said warrant as required by the applicant for the letters patent, shall cause to be prepared letters patent for the invention, according to the tenor of the said warrant, and it shall be lawful for the Lord Chancellor to cause such letters patent to be sealed with the Great Seal of the United Kingdom, and such letters patent so sealed shall extend to the whole of the United Kingdom of Great Britain and Ireland, the Channel Islands, and the Isle of Man; and in case such warrant so direct such letters patent shall be made applicable to Her Majesty's colonies and plantations abroad, or such of them as may be mentioned in such warrant; and such letters patent shall be valid and effectual as to the whole of such United Kingdom, and the said islands and isle, and the said colonies or plantations, or such of them as aforesaid, and shall confer the like powers, rights, and privileges as might, in case this Act had not been passed, have been conferred by several letters patent of the like purport and effect passed under the Great Seal of the United Kingdom, under the seal appointed to be used instead of the Great Seal of Scotland, and under the Great Seal of Ireland respectively, and made applicable to England, the dominion of Wales, the town of Berwick-upon-Tweed, the Channel Islands, the Isle of Man, and the said colonies and plantations, or such of them as aforesaid, to Scotland and to Ireland respectively, save as herein otherwise provided: provided always, that nothing in this Act contained shall be deemed or taken to give any effect or operation to any letters patent to be granted under the authority of this Act in any colony in which such or the like letters patent would be invalid by the law in force in the same colony for the time being: provided always, that a transcript of such letters shall, so soon after the sealing of the same, and in such manner as the Commissioners shall direct, be transmitted to the Director of Chancery in Scotland, and be recorded in the records of Chancery in Scotland, upon payment of such fees as the Commissioners shall appoint, in the same manner and to the same effect in all respects as letters patent passing under the seal appointed by the Treaty of Union to be used in place of the Great Seal of Scotland have heretofore been recorded, and extracts from the said records shall be furnished to all parties requiring the same, on payment of such fees as the Commissioners shall direct, and shall be received in evidence in all courts of Scotland to the like effect as the letters patent themselves.

XIX. Provided always, that no letters patent, save as hereinafter mentioned in the case of letters patent destroyed or lost, shall issue on any warrant granted as aforesaid, unless application be made to seal such letters patent within three months after the date of the said warrant.

XX. Provided also, that no letters patent (save letters patent issued in lieu of others destroyed or lost) shall be issued, or be of any force or effect, unless the same be

granted during the continuance of the provisional protection under this Act, or, when a complete specification has been deposited under this Act, then unless such letters patent be granted during the continuance of the protection conferred under this Act by reason of such deposit, save that where the application to seal such letters patent has been made during the continuance of such provisional or other protection as aforesaid, and the sealing of such letters patent has been delayed by reason of a caveat or an application to the Lord Chancellor against or in relation to the sealing of such letters patent, then such letters patent may be sealed at such time as the Lord Chancellor shall direct.

XXI. Provided also, that where the applicant for such letters patent dies during the continuance of the provisional protection, or the protection by reason of the deposit of a complete specification (as the case may be), such letters patent may be granted to the executors or administrators of such applicant during the continuance of such provisional or other protection, or at any time within three months after the death of such applicant, notwithstanding the expiration of the term of such provisional or other protection, and the letters patent so granted shall be of the like force and effect as if they had been granted to such applicant during the continuance of such provisional or other protection.

XXII. Provided also, that in case any such letters patent shall be destroyed or lost, other letters patent of the like tenor and effect, and sealed and dated as of the same day, may, subject to such regulations as the Commissioners may direct, be issued under the authority of the warrant in pursuance of which the original letters patent were issued.

XXIII. It shall be lawful (the Act of the eighteenth year of King Henry the Sixth, chapter one, or any other Act, to the contrary notwithstanding) to cause any letters patent to be issued in pursuance of this Act to be sealed and bear date as of the day of the application for the same, and in case of such letters patent for any invention provisionally registered under the "Protection of Inventions Act, 1851," as of the day of such provisional registration, or, where the law officer to whom the application was referred, or the Lord Chancellor, thinks fit and directs, any such letters patent as aforesaid may be sealed and bear date as of the day of the sealing of such letters patent, or of any other day between the day of such application or provisional registration and the day of such sealing.

XXIV. Any letters patent issued under this Act sealed and bearing date as of any day prior to the day of the actual sealing thereof shall be of the same force and validity as if they had been sealed on the day as of which the same are expressed to be sealed and bear date: provided always that save where such letters patent are granted for any invention, in respect whereof a complete specification has been deposited upon the application for the same under this Act, no proceeding at law or in equity shall be had upon such letters patent in respect of any infringement committed before the same were actually granted.

XXV. Where, upon any application made after the passing of this Act, letters patent are granted in the United Kingdom for or in respect of any invention first invented in any foreign country, or by the subject of any foreign power or state, and a patent or like privilege for the monopoly or exclusive use or exercise of such invention in any foreign country is there obtained before the grant of such letters patent in the United Kingdom, all rights and privileges under such letters patent shall (notwithstanding any term in such letters patent limited) cease and be void immediately upon the expiration or other determination of the term during which the patent or like privilege obtained in such foreign country shall continue in force, or where more than one such patent or like privilege is obtained abroad, immediately upon the expiration or determination of the term which shall first expire or be determined of such several patents or like privileges: provided always, that no letters patent for or in respect of any invention for which any such patent or like privilege as aforesaid shall have been obtained in any foreign country, and which shall be granted in the said United Kingdom after the expiration of the term for which such patent or privilege was granted or was in force, shall be of any validity.

XXVI. No letters patent for any invention (granted after the passing of this Act) shall extend to prevent the use of such invention in any foreign ship or vessel, or for the navigation of any foreign ship or vessel, which may be in any port of Her Majesty's dominions, or in any of the waters within the jurisdiction of any of Her Majesty's courts, where such invention is not so used for the manufacture of any goods or commodities to be vended within or exported from Her Majesty's dominions: provided always, that this enactment shall not extend to the ships or vessels of any foreign state of which the laws authorise subjects of such foreign state, having patents or like privileges for the exclusive use or exercise of inventions within its territories, to prevent or interfere with

the use of such inventions in British ships or vessels, or in or about the navigation of British ships or vessels, while in the ports of such foreign state, or in the waters within the jurisdiction of its courts, where such inventions are not so used for the manufacture of goods or commodities to be vended within or exported from the territories of such foreign state.

XXVII. All letters patent to be granted under this Act (save only letters patent granted after the filing of a complete specification) shall require the specification thereunder to be filed in the High Court of Chancery, instead of requiring the same to be enrolled, and no enrolment shall be requisite.

XXVIII. Every specification to be filed in pursuance of the condition of any letters patent shall be filed in such office of the Court of Chancery as the Lord Chancellor shall from time to time appoint, and every provisional specification and complete specification left or filed at the office of the Commissioners on the application for any letters patent, shall forthwith after the grant of the letters patent, or if no letters patent be granted then immediately on the expiration of six months from the time of such application, be transferred to and kept in the said office appointed for filing specifications in Chancery; and in case reference is made to drawings in any specifications deposited or filed under this Act, an extra copy of such drawings shall be left with such specification.

XXIX. The Commissioners shall cause true copies of all specifications (other than provisional specifications), disclaimers, and memoranda of alterations filed under or in pursuance of this Act, and of all provisional specifications after the term of the provisional protection of the invention has expired, to be open to the inspection of the public at the office of the Commissioners, and at an office in Edinburgh and Dublin respectively, at all reasonable times, subject to such regulations as the Commissioners may direct; and the Commissioners shall cause a transcript of the said letters patent to be transmitted for enrolment in the Court of Chancery, Dublin, and shall cause the same to be enrolled therein, and the transcript or exemplification thenceforward shall have the like effect to all intents and purposes as if the original letters patent had been enrolled in the Court of Chancery in Dublin, and all parties shall have all their remedies by *scire facias* or otherwise, as if the letters patent had been granted to extend to Ireland only.

XXX. The Commissioners shall cause to be printed, published, and sold, at such prices and in such manner as they may think fit, all specifications, disclaimers, and memoranda of alterations deposited or filed under this Act, and such specifications (not being provisional specifications), disclaimers, and memoranda respectively shall be so printed and published as soon as conveniently may be after the filing thereof respectively, and all such provisional specifications shall be so printed and published as soon as conveniently may be after the expiration of the provisional protection obtained in respect thereof; and it shall be lawful for the Commissioners to present copies of all such publications to such public libraries and museums as they may think fit, and to allow the person depositing or filing any such specification, disclaimer, or memorandum of alteration, to have such number, not exceeding twenty-five, of the copies thereof so printed and published, without any payment for the same, as they may think fit.

XXXI. It shall be lawful for the Lord Chancellor and the Master of the Rolls to direct the enrolment of specifications, disclaimers, and memoranda of alterations heretofore or hereafter enrolled or deposited at the Rolls Chapel-office, or at the Petty Bag-office, or at the Enrolment-office of the Court of Chancery, or in the custody of the Master of the Rolls as keeper of the public records, to be transferred to and kept in the office appointed for filing specifications in Chancery under this Act.

XXXII. The Commissioners shall cause indexes to all specifications, disclaimers, and memoranda of alterations heretofore or to be hereafter enrolled or deposited as last aforesaid to be prepared in such form as they may think fit, and such indexes shall be open to the inspection of the public at such place or places as the Commissioners shall appoint, and subject to the regulations to be made by the Commissioners, and the Commissioners may cause all or any of such indexes, specifications, disclaimers, and memoranda of alterations to be printed, published, and sold in such manner and at such prices as the Commissioners may think fit.

XXXIII. Copies, printed by the printers to the Queen's Majesty, of specifications, disclaimers, and memoranda of alterations shall be admissible in evidence, and deemed and taken to be *primâ facie* evidence of the existence and contents of the documents to which they purport to relate in all courts and in all proceedings relating to letters patent.

XXXIV. There shall be kept at the office appointed for filing specifications in Chancery under this Act a book or books, to be called "The Register of Patents," wherein

shall be entered and recorded in chronological order all letters patent granted under this Act, the deposit or filing of specifications, disclaimers, and memoranda of alterations filed in respect of such letters patent, all amendments in such letters patent and specifications, all confirmations and extensions of such letters patent, the expiry, vacating, or cancelling such letters patent, with the dates thereof respectively, and all other matters and things affecting the validity of such letters patent as the Commissioners may direct, and such register, or a copy thereof, shall be open at all convenient times to the inspection of the public, subject to such regulations as the Commissioners may make.

XXXV. There shall be kept at the office appointed for filing specifications in Chancery under this Act a book or books, entitled "The Register of Proprietors," wherein shall be entered, in such manner as the Commissioners shall direct, the assignment of any letters patent, or of any share or interest therein, any licence under letters patent, and the district to which such licence relates, with the name or names of any person having any share or interest in such letters patent or licence, the date of his or their acquiring such letters patent, share, and interest, and any other matter or thing relating to or affecting the proprietorship in such letters patent or licence; and a copy of any entry in such book, certified under such seal as may have been appointed, or as may be directed by the Lord Chancellor to be used in the said office, shall be given to any person requiring the same, on payment of the fees hereinafter provided; and such copies so certified shall be received in evidence in all courts and in all proceedings, and shall be *primâ facie* proof of the assignment of such letters patent, or share or interest therein, or of the licence or proprietorship, as therein expressed: provided always, that until such entry shall have been made the grantee or grantees of the letters patent shall be deemed and taken to be the sole and exclusive proprietor or proprietors of such letters patent, and of all the licences and privileges thereby given and granted; that certified duplicates of all entries made in the said register of proprietors shall forthwith be transmitted to the office of the Commissioners in Edinburgh and Dublin, where the same shall also be open to the inspection of the public; and any writ of *scire facias* to repeal such letters patent may be issued to the sheriff of the county or counties in which the grantee or grantees resided at the time when the said letters patent were granted; and in case such grantee or grantees do not reside in the United Kingdom, it shall be sufficient to file such writ in the Petty Bag-office, and serve notice thereof in writing at the last known residence or place of business of such grantee or grantees; and such register, or a copy, shall be open to the inspection of the public at the office of the Commissioners, subject to such regulations as the Commissioners may make: provided always, that in any proceeding in Scotland to repeal any letters patent, service of all writs and summonses shall be made according to the existing forms and practice; provided also, that the grantee or grantees of letters patent to be hereafter granted may assign the letters patent for England, Scotland, or Ireland respectively as effectually as if the letters patent had been originally granted to extend to England, or Scotland, or Ireland only, and the assignee or assignees shall have the same rights of action and remedies, and shall be subject to the like actions and suits as he or they should and would have had and been subject to upon the assignment of letters patent granted to England, Ireland, or Scotland before the passing of this Act.

XXXVI. Notwithstanding any proviso that may exist in former letters patent, it shall be lawful for a larger number than twelve persons hereafter to have a legal and beneficial interest in such letters patent.

XXXVII. If any person shall wilfully make, or cause to be made, any false entry in the said register of proprietors, or shall wilfully make or forge, or cause to be made or forged, any writing falsely purporting to be a copy of any entry in the said book, or shall produce or tender, or cause to be produced or tendered, in evidence any such writing, knowing the same to be false or forged, he shall be guilty of a misdemeanor, and shall be published by fine and imprisonment accordingly.

XXXVIII. If any person shall deem himself aggrieved by any entry made under colour of this Act in the said register of proprietors, it shall be lawful for such person to apply, by motion, to the Master of the Rolls, or to any of the courts of common law at Westminster in term time, or by summons to a judge of any of the said courts in vacation, for an order that such entry may be expunged, vacated, or varied; and upon any such application the Master of the Rolls, or such court or judge respectively, may make such order for expunging, vacating, or varying such entry, and as to the costs of such application, as to the said Master of the Rolls, or to such court or judge may seem fit; and the officer having the care and custody of such register, on the production to him of any such order for expunging, vacting, or varying any such

entry, shall expunge, vacate, or vary the same, according to the requisitions of such order.

XXXIX. All the provisions of the Acts of the sessions holden in the fifth and sixth years of King William the Fourth, chapter eighty-three, and of the session holden in the seventh and eighth years of her Majesty, chapter sixty-nine, respectively, relating to disclaimers and memoranda of alterations in letters patent and specifications, except as hereinafter provided, shall be applicable and apply to any letters patent granted, and to any specifications filed under the provisions of this Act: provided always, that all applications for leave to enter a disclaimer or memorandum of alteration shall be made, and all caveats relating thereto shall be lodged at the office of the Commissioners, and shall be referred to the respective law officers in the said first-recited Act mentioned: provided also, that every such disclaimer or memorandum of alteration shall be filed in the office appointed for filing specifications in Chancery under this Act, with the specification to which the same relates, in lieu of being entered or filed, and enrolled as required by the said first-recited Act, or by the Act of the session holden in the twelfth and thirteenth years of her Majesty, chapter one hundred and nine, and the said Act shall be construed accordingly: provided also, that such filing of any disclaimer or memorandum of alteration, in pursuance of the leave of the law-officer in the first-recited Act mentioned, certified as therein mentioned, shall, except in cases of fraud, be conclusive as to the right of the party to enter such disclaimer or memorandum of alteration under the said Acts and this Act; and no objection shall be allowed to be made in any proceeding upon or touching such letters patent, specification, disclaimer, or memorandum of alteration, on the ground that the party entering such disclaimer or memorandum of alteration had not sufficient authority in that behalf: provided also, that no action shall have been brought upon any letters patent in which, or on the specification of which, any disclaimer or memorandum of alteration shall have been filed in respect of any infringement committed prior to the filing of such disclaimer or memorandum of alteration, unless the law-officer shall certify in his fiat that any such action may be brought, notwithstanding the entry or filing of such disclaimer or memorandum of alteration.

XL. All the provisions of the said Act of the fifth and sixth years of King William the Fourth, for the confirmation of any letters patent, and the grant of new letters patent, and all the provisions of the said Act, and of the Acts of the session holden in the second and third years of her Majesty, chapter sixty-seven, and of the session holden in the seventh and eighth years of her Majesty, chapter sixty-nine, respectively, relating to the prolongation of the term of letters patent, and to the grant of new letters patent for a further term, shall extend and apply to any letters patent granted under the provisions of this Act, and it shall be lawful for her Majesty to grant any new letters patent, as in the said Acts mentioned; and in the granting of any such new letters patent her Majesty's order in council shall be a sufficient warrant and authority for the sealing of any new letters patent, and for the insertion in such new letters patent of any restrictions, conditions, and provisions in the said order mentioned; and the Lord Chancellor on the receipt of the said order in council, shall cause letters patent, according to the tenor and effect of such order, to be made and sealed in the manner herein directed for letters patent issued under the warrant of the law-officer: provided always, that such new letters patent shall extend to and be available in and for such places as the original letters patent extended to and were available in: provided also, that such new letters patent shall be sealed and bear date as of the day after the expiration of the term of the original letters patent which may first expire.

XLI. In any action in any of her Majesty's superior courts of record at Westminster or in Dublin for the infringement of letters patent, the plaintiff shall deliver with his declaration particulars of the breaches complained of in the said action, and the defendant, on pleading thereto, shall deliver with his pleas, and the prosecutor in any proceedings by *scire facias* to repeal letters patent shall deliver with his declaration, particulars of any objections on which he means to rely at the trial in support of the pleas in the said action or of the suggestions of the said declaration in the proceedings by *scire facias* respectively; and at the trial of such action or proceedings by *scire facias* no evidence shall be allowed to be given in support of any alleged infringement, or of any objection impeaching the validity of such letters patent which shall not be contained in the particulars delivered as aforesaid: provided always, that the place or places at, or in which, and in what manner the invention is alleged to have been used or published prior to the date of the letters patent shall be stated in such particulars: provided also, that it shall and may be lawful for any judge at chambers to allow such plaintiff or defendant, or prosecutor respectively to amend the particulars delivered as aforesaid,

upon such terms as to such judge shall seem fit: provided also, that at the trial of any proceeding by *scire facias* to repeal letters patent, the defendant shall be entitled to begin and to give evidence in support of such letters patent, and in case evidence shall be adduced on the part of the prosecutor impeaching the validity of such letters patent, the defendant shall be entitled to the reply.

XLII. In any action in any of her Majesty's superior Courts of Record at Westminster and in Dublin for the infringement of letters patent, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting, then for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such Court or judge may seem fit.

XLIII. In taxing the costs in any action in any of her Majesty's superior Courts at Westminster or in Dublin commenced after the passing of this Act for infringing letters patent, regard shall be had to the particulars delivered in such action, and the plaintiff and defendant respectively shall not be allowed any costs in respect of any particular unless certified by the judge before whom the trial was had to have been proved by such plaintiff or defendant respectively, without regard to the general costs of the cause; and it shall be lawful for the judge before whom any such action shall be tried to certify on the record that the validity of the letters patent in the declaration mentioned came in question; and the record, with such certificate, being given in evidence in any suit or action for infringing the said letters patent, or in any proceeding by *scire facias* to repeal the letters patent, shall entitle the plaintiff in any such suit or action, or the defendant in such proceeding by *scire facias*, on obtaining a decree, decretal order, or final judgment, to his full costs, charges, and expenses, taxed as between attorney and client, unless the judge making such decree or order, or the judge trying such action or proceeding, shall certify that the plaintiff or defendant respectively ought not to have such full costs: provided always, that nothing herein contained shall affect the jurisdiction and forms of process of the Courts in Scotland in any action for the infringement of letters patent, or in any action or proceeding respecting letters patent hitherto competent to the said Courts: provided also, that when any proceedings shall require to be taken in Scotland to repeal any letters patent, such proceedings shall be taken in the form of an action of reduction at the instance of her Majesty's Advocate, or at the instance of any other party having interest with concurrence of her Majesty's Advocate, which concurrence Her Majesty's Advocate is authorised and empowered to give upon just cause shown only.

XLIV. There shall be paid in respect of letters patent applied for or issued as herein mentioned, the filing of specifications and disclaimers, certificates, entries, and searches, and other matters and things mentioned in the schedule to this Act, such fees as are mentioned in the said schedule; and there shall be paid unto and for the use of her Majesty, her heirs and successors, for or in respect of the warrants and certificates mentioned in the said schedule, or the vellum, parchment, or paper on which the same respectively are written, the stamp duties mentioned in the said schedule; and no other stamp duties shall be levied, or fees, except as hereinafter mentioned, taken in respect to such letters patent and specifications, and the matters and things in such schedule mentioned.

XLV. The stamp duties hereby granted shall be under the care and management of the Commissioners of Inland Revenue; and the several rules, regulations, provisions, penalties, clauses, and matters contained in any Act now or hereafter to be in force with reference to stamp duties shall be applicable thereto.

XLVI. The fees to be paid as aforesaid shall from time to time be paid into the receipt of the Exchequer, and be carried to and made part of the consolidated fund of the United Kingdom.

XLVII. Provided always, that nothing herein contained shall prevent the payment as heretofore to the law-officers in cases of opposition to the granting of letters patent, and in cases of disclaimers and memoranda of alterations, of such fees as may be appointed by the Lord Chancellor and Master of the Rolls as the fees to be paid on the hearing of such oppositions, and in the case of disclaimers and memoranda of alterations respectively, or of such reasonable sums for office or other copies of documents in the office of the Commissioners, as the Commissioners may from time to time appoint to be paid for such copies, and the Lord Chancellor and Master of the Rolls, and the Commissioners, are hereby respectively authorized and empowered to appoint the fees to be so paid in respect of such oppositions, disclaimers, and memoranda of alterations respectively, and for such office or other copies.

XLVIII. It shall be lawful for the Commissioners of her Majesty's Treasury from

time to time to allow such fees to the law-officers and their clerks (for duties under this Act in respect of which fees may not be payable to them under the provisions lastly hereinbefore contained) as the Lord Chancellor and Master of the Rolls may from time to time appoint, and to allow such salaries and payments to any clerks and officers to be appointed under this Act, and such additional salaries and payments to any other clerks and officers in respect of any additional duties imposed on them by this Act, as the said Commissioners of the Treasury may think fit.

XLIX. It shall be lawful for the Commissioners of her Majesty's Treasury to allow from time to time the necessary sums providing offices under this Act, and for the fees, salaries, and payments allowed by them as aforesaid, and for defraying the current and incidental expenses of such office or offices; and the sums to be so allowed shall be paid out of such monies as may be provided by Parliament for that purpose.

L. And whereas divers persons by virtue of their offices or appointments are entitled to fees or charges payable in respect of letters patent as heretofore granted within the United Kingdom of Great Britain and Ireland, or have and derive in respect of such letters patent, or the procedure for the granting thereof, fees or other emoluments or advantages:

It shall be lawful for the said Commissioners of the Treasury to grant to any such persons who may sustain any loss of fees, emoluments, or advantages by reason of the passing of this Act, such compensation as, having regard to the tenure and nature of their respective offices and appointments, such Commissioners deem just and proper to be awarded; and all such compensations shall be paid out of such monies as may be provided by Parliament for that purpose: provided always, that in case any person to whom any yearly sum by way of compensation shall be awarded and paid shall, after the passing of this Act, be appointed to any office or place of emolument under the provisions of this Act, or in the public service, then and in every such case the amount of such yearly sum shall in every year be diminished by so much as the emoluments of such person for such year from such office or place shall amount to, and provision in that behalf shall be made in the award to him of such yearly sum.

LI. An account of all salaries, fees, allowances, sums, and compensations to be appointed, allowed, or granted under this Act shall, within fourteen days next after the same shall be so appointed, allowed, or granted respectively, be laid before both Houses of Parliament, if Parliament be then sitting, or if Parliament be not then sitting, then within fourteen days after the next meeting of Parliament.

LII. Letters patent may be granted in respect of applications made before the passing of this Act, in like manner and subject to the same provisions as if this Act had not been passed.

LIII. Where letters patent for England, or Scotland, or Ireland have been granted before the passing of this Act, or are in respect of any application made before the passing of this Act hereafter granted for any invention, letters patent for England, or Scotland, or Ireland may be granted for such invention in like manner as if this Act had not been passed: provided always, that in lieu of all the fees or payments and stamp duties now payable in respect of such letters patent, or in or about obtaining a grant thereof, there shall be paid in respect of such letters patent for England, or Scotland, or Ireland, on the sealing of such respective letters patent, a sum equal to one-third part of the fees and stamp duties which would be payable according to the schedule to this Act in respect of letters patent issued for the United Kingdom under this Act, on or previously to the sealing of such letters patent; and at or before the expiration of the third year and the seventh year respectively of the term granted by such letters patent for England, or Scotland, or Ireland, sums equal to one-third part of the fees and stamp duties payable at the expiration of the third year and the seventh year respectively of the term granted by letters patent issued for the United Kingdom under this Act; and the condition of such letters patent for England, or Scotland, or Ireland shall be varied accordingly; and such fees shall be paid to such persons as the Commissioners of her Majesty's Treasury shall appoint, and shall be carried to and form part of the said consolidated fund.

LIV. The several forms in the schedule to this Act may be used for and in respect of the several matters therein mentioned, and the commissioners may, where they think fit, vary such forms as occasion may require, and cause to be printed and circulated such other forms as they may think fit to be used for the purposes of this Act.

LV. In the construction of this Act the following expressions shall have the meanings hereby assigned them, unless such meanings be repugnant to or inconsistent with the context; (that is to say,)

The Expression "Lord Chancellor" shall mean the Lord Chancellor, or Lord Keeper of the Great Seal, or Lord Commissioners of the Great Seal.

The Expression "The Commissioners" shall mean the Commissioners for the time being acting in execution of this Act.

The Expression "Law Officer" shall mean her Majesty's Attorney-general or Solicitor-general for the time being for England, or the Lord Advocate, or her Majesty's Solicitor-general for the time being for Scotland, or her Majesty's Attorney-general or Solicitor-general for the time being for Ireland.

The Expression "Invention" shall mean any Manner of new Manufacture the Subject of Letters Patent and Grant of Privilege within the Meaning of the Act of the Twenty-first Year of the Reign of King James the First, Chapter Three.

The Expression "Petition," "Declaration," "Provisional Specification," "Warrant," and "Letters" respectively, shall mean Instruments in the Form and to the effect in the Schedule hereto annexed, subject to such Alterations as may from Time to Time be made therein under the Powers and Provisions of this Act.

LVI. In citing this Act in other Acts of Parliament, Instruments, and Proceedings, it shall be sufficient to use the Expression "The Patent Law Amendment Act, 1852."

LVII. This Act shall commence and take effect from the First Day of October One thousand eight hundred and fifty-two.

The SCHEDULE to which this Act refers.

Fees to be Paid.

	£	s.	d.
On leaving Petition for Grant of Letters Patent	5	0	0
On Notice of Intention to proceed with the Application	5	0	0
On sealing of Letters Patent	5	0	0
On filing Specification	5	0	0
At or before the Expiration of the Third Year	40	0	0
At or before the Expiration of the Seventh Year	80	0	0
On leaving Notice of Objections	2	0	0
Every Search and Inspection	0	1	0
Entry of Assignment or Licence	0	5	0
Certificate of Assignment to Licence	0	5	0
Filing Application for Disclaimer	5	0	0
Caveat against Disclaimer	2	0	0

Stamp Duties to be Paid.

	£	s.	d.
On Warrant of Law-officers for Letters Patent	5	0	0
On Certificate of Payment of the Fee payable at or before the Expiration of the Third Year.	10	0	0
On Certificate of Payment of the Fee payable at or before the Expiration of the Seventh Year	20	0	0

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JUNE 29, 1852.

AUGUSTUS APPLEGATH, of Dartford, Kent. *For improvements in machinery used for printing.* Patent dated December 24, 1851.

Claims.—The division of the form of type upon two cylinders, whether such cylinders are placed horizontally or vertically, or however combined with the impression cylinder and other parts of a printing machine. Also, the galley-chase for retaining the type. Also, the use of taper type having sides tapering to a larger angle than that given by the cylinder from which it is imposed. And further, the double action by arranging two impression cylinders to act against the type cylinders, whereby two complete impressions are obtained at each revolution of the type. (In our next we shall give full particulars with engravings of Mr. Applegath's new machines.)

ANTONIO DE SOLA, of Madrid. *For certain improvements in the treatment of copper minerals.* (A communication.) Patent dated December 24, 1851.

This invention consists of a new process for separating copper from its ores by the employment of voltaic electricity.

The ores are first calcined (with the addition of sulphur in case there is not a sufficient quantity present) to bring them to the state of sulphate, which is dissolved in water, and the copper separated from the solution by a voltaic battery composed of alternate plates of copper and iron or lead immersed therein, and excited by the usual acid solutions. In order to facilitate the separation of the copper, heat may be applied to the vessel containing the liquid and battery.

Claims.—1. The employment of a voltaic battery to separate the copper from the ores.

2. The preparation of the mineral ores, to render them fit for this mode of operating.

3. A particular arrangement of basins or receivers for the precipitation of the metal.

4. The arrangement of the voltaic battery in a heated chamber or receiver, in order to increase the power of the apparatus, and for hastening the operation.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For improvements in separating substances of different specific gravities.* (A communication.) Patent dated December 24, 1851.

The machinery or apparatus which constitutes the subject of this patent is adapted especially for the separation of copper from

the gangue in which it is contained, and consists mainly of a curved pan, to which a rocking motion is given similar to that imparted to a shovel in the operation of "vanning." The pan is suspended at its rear end by two long pendulous rods, and at its front by two short rods inclining upwards and backwards to the point of suspension of the rear, and motion is given to the pan by cranks. A stream of water is also employed for carrying off the lighter particles through holes pierced at the rear end of the pan, while the copper or other separated substance is delivered over the front of the pan.

Claims.—1. Giving to the reciprocating pan the peculiar motion described.

2. Giving the back movement to the pan in a less time than the forward movement, by means of a crank or cranks whose axis of motion is below the plane of motion of the rear end of the pan.

3. The employment, in combination with a pan having the motion described, of a current or currents of water descending the curved or inclined surface of the pan.

4. Making the rear end of the pan with an incline or curve upwards.

5. Making the pan with apertures behind the place where the substances to be separated are supplied.

6. Making the front and rear ends of the pan (having the motion described) with a gradual curve downwards when the same is employed in combination with currents of water.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Samuel Lusty, of Birmingham, for improvements in manufacturing wire into woven fabrics and pins. June 24; six months.

Thomas Bell, of Don Alkali Works, South Shields, for improvements in the manufacture of sulphuric acid. June 24; six months.

Joseph Morgan, of Manchester, patent candle-machine manufacturer, and Peter Gaskell, of the same place, gentleman, for improvements in the manufacture of candles. June 24; six months.

Charles James Wallis, of Clarendon Chambers, Hand-court, Holborn, civil engineer and mechanical draughtsman, for improvements in machinery for crushing, pulverizing, and grinding stone, quartz, and other substances. June 24; six months.

Thomas Bazley, of Manchester, cotton-spinner, for improvements in machines for combing cotton, flax, silk, and other fibrous materials. June 24; six months.

John M'Conochie, of Liverpool, engineer, for improvements in locomotive and other steam engines and boilers, in railways, railway carriages, and their appurtenances; also in machinery and apparatus for producing part or parts of such improvements. June 24; six months.

Thomas Allan, of Edinburgh, engineer, for improvements in producing and applying electricity, and in apparatus employed therein. June 24; six months.

Thomas Hoblyn, of White Barns, Hertford, Esq., for certain improvements in the art of navigation. June 28; six months.

Matthew Augustus Crooker, engineer, of the City of New York, America, for certain improvements in paddles for steam vessels. June 28; six months.

James Edward Coleman, of Porchester House, Bayswater, gentleman, for improvements in the application of India-rubber and gutta percha, and of compounds thereof. June 28; six months.

Duncan Mackenzie, of London, gentleman, for certain improvements in machinery and apparatus for reading in and transferring designs or patterns, and for cutting, punching, and numbering, or otherwise preparing perforated cards, papers, or other materials used or suitable in the manufacture of figured textile fabrics by Jacquards or other weaving looms or frames. June 29; six months.

Lazare François Vandelin, of Upper Charlotte-street, Fitzroy-square, for improvements in obtaining wool, silk, and cotton, from old fabrics in a condition to be again used. (Being partly a communication.) June 30; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
June 29	3311	Tylor and Pace	John-street, Hackney	Heating Apparatus for baths.
"	3312	T. Allan	Edinburgh	Electrode.
30	3313	T. Hills and Son	Cooper-street, City-road	Gold washing and reserving machine.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

June 29	438	T. Pope	Birmingham	Press for embossing, raising and piercing.
30	439	Capt. A. Collingridge	South-street, Brompton	Shank for vests, shirts, and other buttons.

CONTENTS OF THIS NUMBER.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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Edited by J. C. Robertson, 166, Fleet-street.

APPLEGATH'S "VICTORIA" PRINTING MACHINES.

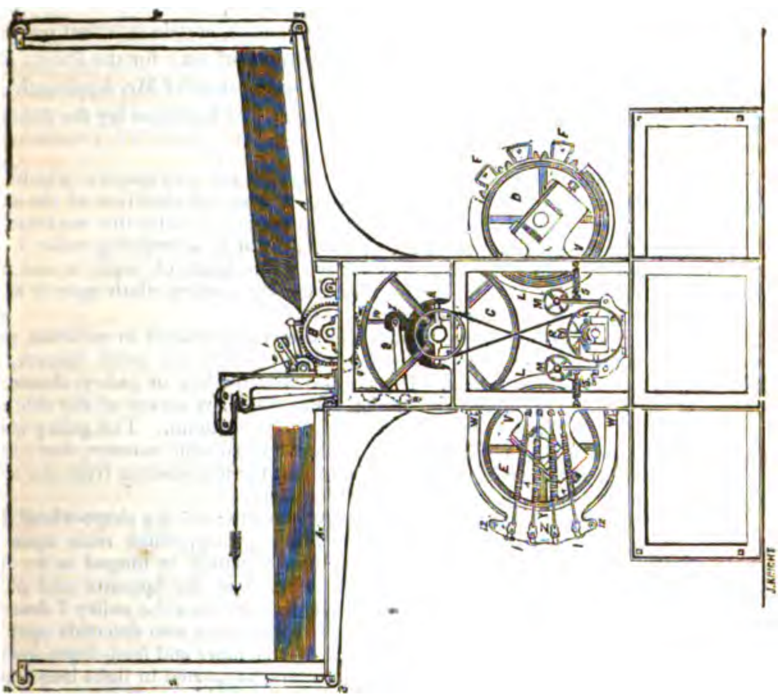


Fig. 1

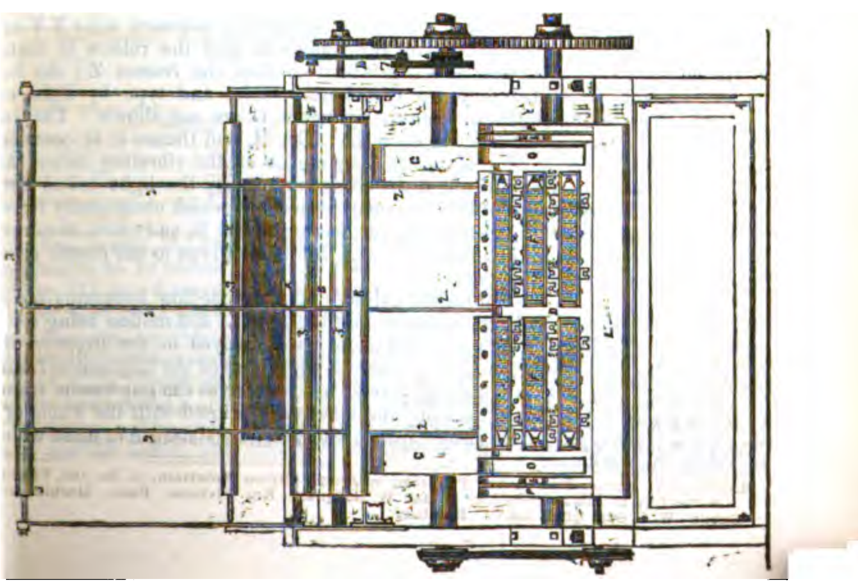


Fig. 2.

APPLEGATH'S "VICTORIA" PRINTING MACHINES.

About four years ago, we gave an account of the great improvements in steam-printing effected at the *Times* office, under the auspices of the late Mr. Walter, ending with what was then deemed a "crowning triumph"—the vertical cylinder press of Mr. Applegath, by which the number of impressions was raised from 5,000 to 14,400 per hour (see *Mech. Mag.*, No. 1258, for September 18, 1847.) Little room as there seemed to be left for further improvement, certain it is that invention had by no means reached its limits in this department of art; for the Patent Rolls present us this week with the specification of a second patent of Mr. Applegath's, in which he has greatly outdone all his former doings. We hasten to lay the following ample details before our readers:

Figure 1 is a side elevation of a machine adapted for newspapers, which Mr. Applegath calls a "Victoria" machine; and fig. 2 is an end elevation of the same. A is the ordinary feed-board, upon which the paper is laid by the workman; it is furnished with the usual apparatus, viz., a feed-drum B, a dropping roller I, sets of endless tapes 2 2, and rollers 3 3, for conveying the sheets of paper to and from the impression cylinder C, which has the customary woollen cloth upon it at the part where the impression takes place.

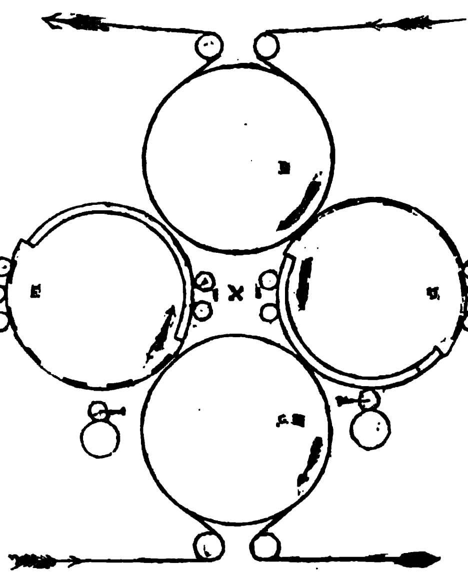
D and E are the type cylinders, upon which the type is placed in columns, some of the columns being upon D, and some upon E. O O are the usual bearers, and P P the lifts for the inking rollers. F F are the type-holders or galley-chases, the column of type being securely held in the galley-chase by means of the side nuts and screws G G, and the set screw H at the foot of the column. The galley-chases may be attached to the type cylinder by screws, in any suitable manner, due regard being had to their distances from each other, so that the impressions from the alternate columns may fall in right position upon the paper.

The action of the dropping roller is obtained as follows:—6 is a shape-wheel fixed upon the spindle of the impression cylinder; 7 is a pulley, which rests upon the shape-wheel, and revolves upon a pin in the arm 8, which is hinged at 9: from the arm a light rod rises to a lever 10, which is fixed at the opposite end of the ordinary vibrating spindle of the dropping roller, so that when the pulley 7 descends into the depression of the shape-wheel 6, the dropping roller also descends upon the sheet of paper, which is drawn by the motion of the tapes and feed-drum towards the impression cylinder. I I are the inking rollers, supported in light iron frames Z, which are connected to the frame of the machine by hinges W W at Y: small pulleys are fixed to the frames Z, which act against the indented sides V V of the cylinders D and E, thereby causing the frames Z, and the rollers in them, to move endways: 12 are light iron rods which connect the frames Z; the inking rollers are kept in contact with the distributing tables and type by light coiled springs. The inking rollers of the type cylinders D are not shown. The ink is received from the ductor roller K upon the roller R, and thence it is occasionally carried to the distributing surfaces L L by means of the vibrating rollers M M, which are kept in contact with the distributing surfaces by the light coiled springs 5 5; but on the middle set of lifts are small projections which occasionally force the vibrating rollers against the distributing surfaces on D and E, and which thus receive a fresh portion of ink in the usual manner. Motion is given to the ductor roller K by a band pulling over a rigger on C.

The type cylinders, the impression cylinder, and the feeding apparatus are connected by toothed wheels in the manner shown in fig. II., and motion being communicated to them, the sheet of paper laid upon A is conveyed in the direction of the arrows to the impression cylinder C, where it first receives the impression from the columns placed upon D, and then as it revolves it receives the impression from the columns placed upon E, and thus the sheet becomes printed with the whole of the form, and is conveyed by the usual tapes to the receiving-board A*, upon which it is laid by the workman.

The objects gained by dividing the form into columns placed upon the type cylinders is, that the type can be more securely held in single columns than in pages composed of several columns, and also that cylinders of small diameter may be employed, which may be placed horizontally as well as vertically; whereas in the machinery used at the *Times*, to which this patent is intended to be a sequel, the type cylinder is 200 inches in circumference, and being made to revolve vertically, expensive feeding apparatus is required for the conveyance of the sheets from the flat to the vertical position: on the principle, however, of dividing the form into columns, the cylinder for ordinary type need not be more than 70 inches in circumference, and when taper, or "wedge-sided" type is employed, the cylinder need not be more in circumference than the size of the sheet of paper (measuring across the columns, which permits the printing of long continuous paper, as indicated in Nicholson's Patent of 1792.

Fig. 6.



In figs. I. and II., the circumference of the type and impression cylinder is supposed to be 70 inches, which gives space for the form, and a distributing surface; but fig. III. is a diagram showing a journal of 12 columns and 36 inches width, divided upon two cylinders of 36 inches circumference. F F are the type-holders; F* is the type, the sides of which are bevelled, but not to the angle which a circumference of 36 inches would indicate; for a column of type 3 inches wide, tapered to such an angle, would not lock up, but would rise as the sides or abutments advanced and pressed against it; therefore the type is bevelled to the angle given by a circle of 70 inches. The enclosing black line represents a circle of 36 inches circumference, and the dotted lines represent columns of type with sides bevelled to a circle

Fig. 7.

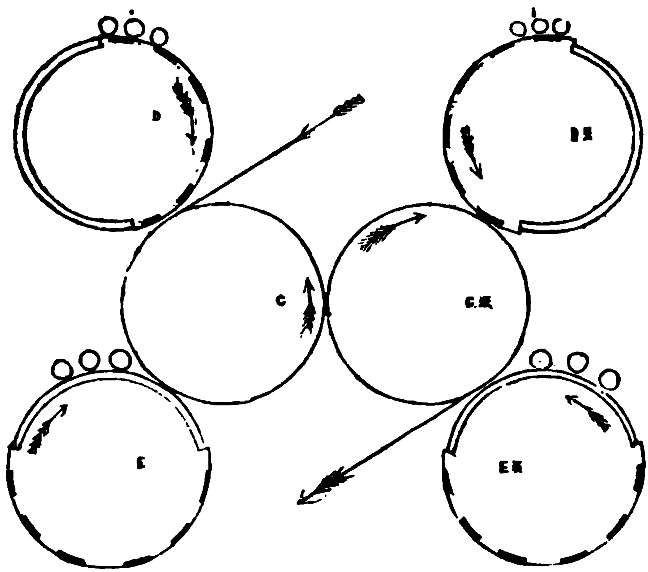


Fig. 8.

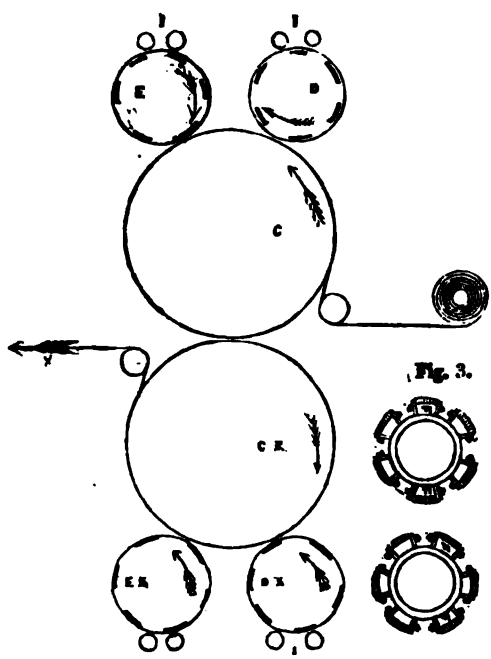


Fig. 3.

of 70 inches. The flattening of the type may be remedied by overlaying the impression cylinder, and it may also be assisted by shaping the bed of the type-holder as at column I. on the left-hand cylinder, so that at last the impression will not be discernable from that of a true circular surface.

Fig. IV. is a diagram showing part of a cylinder of 70 inches circumference, on which a column of the ordinary flat type is used segmentally; and the bed of the type-holder 7, is shown, shaped in the manner of those used at the *Times* machines.

The paper or impression cylinder being also overlaid, to compensate the flattening of the segment.

Fig. V. is a diagram showing the type made to a circle of 70 inches, and placed upon a cylinder of 100 inches circumference; which in some cases may be more convenient for book-work.

Mr. Applegath does not limit himself to these inventions, for machines upon the principle of a division of the type may be made of various forms too numerous to insert in a specification; but he indicates by a series of diagrams the class of machines most likely to become useful.

Fig. 6 is a side diagram of a double-action Victoria machine, to print a journal either with ordinary or with taper type. The cylinders are 70 inches circumference, and revolve in the direction of the arrows. The type is divided, as before described, upon the cylinders D and E, which have distributing surfaces upon them, and each type cylinder has two sets of inking rollers I I, so that when the type has imparted its ink to the paper upon the upper cylinder C, it acquires a fresh charge of ink from the inner set of inking rollers at X, before it comes in contact with the sheet of paper upon the lower cylinder C*, and thus the type performs a double action by printing two sheets at each revolution. The feed and taking off boards are not shown in this diagram, as their position must depend upon the room in which the machine is to be worked. This machine, with ordinary type, and distributing surfaces, can safely be worked up to the supply of paper afforded by six layers on, or from 8,000 to 9,000 per hour. But, if taper type is used, the circumference of the type cylinder need not be more than about 36 inches, or the dimensions of the paper upon which the journal is printed; in which case a different arrangement of inking apparatus would be required, and the produce nearly doubled.

Fig. 7 is a side diagram of type and impression cylinders of 70 inches circumference, arranged so as to form a perfecting machine, and may be used either for journals or bookwork.

The motion is in the direction of the arrows, and the paper issues from the machine at X printed on both sides.

Fig. 8 is a convenient form for a perfecting machine to print "rolls," or long sheets of paper, with taper type. D and E are the type cylinders, say 36 inches circumference. C and C* are the impression cylinders. The motion is in the direction of the arrows, and the paper issues, printed upon both sides, at X, where it may be cut or separated by any convenient apparatus. This machine being without distributing surfaces, ink must be supplied to the rollers I I by any of the means ususally employed in machines without distributing surfaces.

In preparing type for these machines, and especially when taper type is used, Mr. Applegath recommends the compositor to dispense with the common gallies, and to put the matter into the galley-chase where proofs may be taken, and corrections made. By these means the ordinary "making up" will be saved, and if alterations are required during the working, such alterations can be conveniently made in the column chases.

Machines on the principle of dividing the type may be made of various other forms besides those which have been indicated. The inventor does not limit himself to any particular construction, but claims the division of the form of type upon two cylinders, whether such cylinders are placed horizontal or vertically, or however combined with the impression cylinder and other parts of a printing machine; also, the galley-chase for retaining the type. Also, the use of taper type, having sides

tapering to a larger angle than that given by the cylinder upon which it is imposed. Mr. Applegath further claims the double-action, by arranging two impression cylinders to act against the type cylinders, whereby two complete impressions are obtained at each revolution of the type.

EDUCATION OF PAUPER CHILDREN.

The *Times*, on the 21st ult., stated in its Birmingham article that great numbers of the industrial classes are emigrating to Australia, attracted by her gold fields, and that this movement extends to skilled no less than to unskilled workmen. Extensive emigration cannot but materially influence the well-being of mechanical and manufacturing individuals left at home, and that from the wealthiest employer down to the most humble of the employed; the subject, therefore, seems a proper one for investigation in the *Mechanics' Magazine.*

As to emigrants from Birmingham, or other places where much machinery is in use, it may be doubted whether their operatives are suitable for either gold-digging, for sheep and cattle keeping, or for other labours in the Bush. The operatives of Birmingham are most of them employed *within* doors, and most frequently for the performance of one single manufacturing operation; they are not accustomed to vicissitudes of weather such as all must be exposed to in out-door work; their habits are such as greatly to diminish their powers of accommodation to a new business, or to a new mode of life. Expertness in a single manufacturing operation all workpeople in a manufactory may have acquired, but having been reared to that only one, they know not how to turn their hands to any other employment; to the greater part of emigrants of this description disappointment could hardly fail to be the consequence,—discontent, idleness, murmurs and disease its followers.

In regard to skilled workmen, they, like the above-mentioned people, are unaccustomed to vicissitudes of climate out of doors, and would suffer even more severely by exposure to it, and from the privations they of necessity must endure if at the diggings. Employment in tending flocks or cattle would, indeed, be a sad falling off to the skilled workman in both pay and comfort; true, that in Australian towns a few artificers, such as cabinet-makers, might perchance obtain sufficiency of work; but the great mass of Birmingham skilled operatives only put together and finish articles of which machinery has prepared the parts—there is no machinery in Australia, capital there can be more profitably employed than in providing it; manufactured goods can be imported from the Mother country at a lower price than they can be made by hand; so that the skilled, like the unskilled, workman in Australia, must of need betake himself either to the diggings or the Bush. His wife, how would it be with her? No girl willing for a meal to do the drudgery of household work; no neatly painted and prepared habitation in the bush; no black-leaded stove, nor brightly redded bricks about the fireplace, nor stone to whiten the hearth; even the dirt and smoke of a coal fire would be regretted, although wood enough were at command to make roaring fires. It may seem absurd to mention such trivialities, but the force of habit render them as necessaries to the comfort of women in humble life.

What, then, is the description of persons best suited for emigration to Australia, most likely to be happy there themselves, most wanted on those lands, and the absence of whom would most benefit this country? Some vague perceptions of this class have from time to time emanated from different quarters, but do not seem to have been brought forward so prominently as they deserve to be.

It had been long ago suggested, and of late has been publicly said, that the *able-bodied inmats of a workhouse* best responds to the several requisite conditions. Most of such persons have been used to every kind of work they could obtain, and would have turned their hands willingly to every variety of it

rather than become paupers; they have become exposed to all weathers, fair or foul; have been subjected to privations and hardships—to want of sufficient nourishment, clothing, shelter for the night—to see their offspring perish; they have been but too intimately acquainted with all the ills of poverty consequent on a dearth of work; can it be doubted that to such persons service in the Bush would be an elysium? The damper, the abundant meal of meat, the can of tea, would to them be luxuries; the coarsest clothing of the shepherd—sumptuous apparel compared to former rags, or to a parish livery, stamped with the badge of dependence on a parish rate reluctantly accorded. This, then, is the class of *adults* in every respect more suitable as emigrants to Australia than any description of manufacturing operatives.

Parish poor have of late years cost the nation annually about a million sterling. The rate for their maintenance falls upon the workman liable to parish rates no less than upon the wealthiest master or the independent gentleman, though in amount it be according to the rent of their respective dwellings; it therefore behoves all alike to consider the means by which poor rates are susceptible of diminution consistently with the temporal happiness, the morals, and the eternal welfare of the pauper.

It has been affirmed that, under good management, the labour of the parish poor might pay for their support; but attempts to furnish them with remunerative work have uniformly failed. This has, in part, arisen from the difficulty of procuring suitable employment, but in a much greater degree from the over-population under which this country is labouring. For this reason, when overseers of the poor have introduced industrial occupation in a workhouse, the attempt has failed from the clamour raised against them by the public voice. If needlework, it was taking bread from the mouths of poor sempstresses; if straw-plaiting, bringing ruin on industrious females earning an honest livelihood at this business. Field-labour has been proposed for men; but, not to speak of the impossibility of obtaining it in the vicinity of most workhouses, such competition would be no less injurious to farm labourers earning 8*s*. or 10*s*. a week than is female competition with poor sempstresses.

Facts being so, it is, in a pecuniary point of view, to the interest of rate-payers to facilitate emigration of parish poor rather than any other description of persons. Figures show that it would be much less costly to pay the passage-money of a pauper to Australia than to maintain him in a workhouse. Few of those who have once entered it are its inmates for so short a time as two years, and the cost for each pauper for that time being about 20*l*., this sum would more than pay passage-money, outfit, and every incidental expense of sending an individual to Australia.

Advantageous as it is for a parish to afford the means of sending its adult paupers to Australia, it is on every account still more so thus to provide for its pauper *children*. Such a measure was suggested about two years ago, and communicated to Mrs. Chisholm last year, on the 9th of October, in the following words:—"The transmission of this description of the poor to foreign settlements would, in fact, afford important relief at home, and secure a future provision for the children physically; whilst their morals and religion would be far less liable to contamination than in this country, where juvenile depravity draws such numbers of poor children into its vortex. Even where youthful paupers are trained up at home in the utmost conceivable perfection, at the end of childhood they necessarily become competitors in the overstocked labour-market,—competitors with the offspring of industrious operatives or labourers who, by their own frugality, have reared their families without eleemosynary assistance. But where lands have to be brought into cultivation, or flocks to be tended on natural pastures, no doubt can be entertained but that robust children, already inured to the climate of the place, would be remuneratively employed at an early age, without taking bread from the children of independent labourers at home."

That great and true friend of the labouring-classes, the Earl of Shaftesbury, now advocates the cause of pauper children,—prepared a bill for the enabling parish authorities to send juvenile

paupers to Australia, and proposed it in the House of Peers, but too late for discussion during the last session of Parliament; but surely, under his Lordship's auspices, this desirable end will be attained, and, in the meantime, that active, benevolent, and judicious lady, Mrs. Chisholm, has announced that she will shortly assemble a meeting for the purpose of forwarding the projected measure.

Pauper children may be considered as under the special guardianship of the *state;* it cannot but be the duty of the guardians to provide for these children such an education as shall enable them to earn a competency in this life, to pass through it in irreproachable morality, to imbue them with religious faith and feelings; but at the same time that care of these helpless beings is imposed upon the state, it has its duty also towards the general mass of population in the realm; hence the Legislature has to provide that the rearing of pauper children should be as little burthensome as possible to the general mass; and that when childhood ceases, whilst juvenile paupers become useful members of society, they should not encroach injuriously on the means by which other descriptions of persons earn a livelihood. In how far does the present training of pauper children fulfil these several conditions?

The treatment of such children may be said, generally speaking, to be of three very different descriptions. In some establishments little more is thought of than providing scantily for physical wants, and the giving a mere semblance of religious and moral instruction by routine tuition. Alas! too many instances of this pernicious education in parish schools might be adduced! A second mode is that of which Swinton affords an example; it is for the reception of the pauper children of Manchester. The edifice itself is a palace in appearance, and includes all that is essential in a habitation to invigorate the human frame. At Swinton, present enjoyment of the children is uniformly sought, insomuch that when any listlessness is observed, the child is dismissed from his lesson, and sent to *play;* probity and other moral virtues are inculcated; reading, writing, &c., are well attended to; religious instruction afforded by a resident chaplain; some little industrial teaching is given in tailoring, needlework, and so forth; but no endeavour is made to instruct the pauper child in handicraft or other works by which, on leaving Swindon, it can earn a livelihood. The third description of pauper school is exemplified in the Limehouse Training-school of Industry. The children in this, and in the United Industrial School of Edinburgh, are early initiated and employed in various handicrafts, and with so much advantage to the rate-payers, that the usual period of a child's residence in other pauper establishments is in that of Limehouse shortened by two years.

Lord Shaftesbury, in the House of Peers, to show the effect of such rearing as the above first-mentioned, cited the testimony of a churchwarden to the state and prospects of workhouse children:—"The cost," he said, "of educating and maintaining such children is at the rate of 3*s*. 6*d*. a week each. We cannot put them out to service till they are fourteen. They are soon returned upon our hands; the girls in many cases pregnant. They often marry at an early age, and beget a race of paupers. I am often shocked to recognize in our workhouse the same familiar faces, — the said 'workhouse birds,'—now fathers and mothers, whom I saw there as children twenty years ago. They know the law; they can tell how far they may safely go; they do not work, and yet they do not refuse to work; for they know that if they refuse, they become liable to punishment."

What the effect may be of the luxurious mode in which pauper children are reared at Swinton has not appeared. Doubtless, many of them become domestic servants,—several of them good ones. But their education is extravagantly costly, far exceeding what the general run of operatives can afford for their offspring. The salaries alone of the establishment at Swinton, including the board of some officers, amount to more than 3*l*. a head for the 630 children there maintained. Habitation in a palace that has about it an acre and a half of *flower*-garden, does not seem altogether calculated to instil humble and economical ideas in the paupers, though it does evince the liberality of the inhabitants of Manchester, at whose expense the

establishment was erected, and at whose cost it is still maintained.

The education of pauper children in Limehouse parish is such as to enable them by honest industry to maintain themselves on leaving school; and it may be supposed to make them in after life scorn the becoming burthens on the parish. As far as regards such individuals themselves, similar education is most desirable—but the influence it would have on the general mass of operatives points to the sending pauper children to Australia in preference to educating them at home, even as at Limehouse. Already there is a superabundance of carpenters, turners, and, it may be said, of all other handicraft workmen; there are many more of them than there is work for; consequently, very many industrious hands are either not employed at all, or obtain only a few weeks' work now and then; increase their number extensively, it will be with them as it is with poor needle-women; the payment for work will be lowered by competition till the earnings of a man will be reduced to the few pence a day that a poor seamstress earns by her twelve or fourteen hours' work.

It is the same, it may be said, in all handicraft, manufacturing, and rural occupations; where there is a superabundance of candidates for work, the price paid for it will fall and fall, till it sinks below the sum for which the absolute necessaries of life can be provided. Thus it behoves all of the industrial classes to promote the emigration of the superfluous part of our population; no less is it their interest than it is that of all poor-rate payers to lend a voice in diminishing this burthen upon them. To conclude in words to be found in the above-mentioned letter to Mrs. Chisholm, "Much inquiry has convinced me that *paupers* are the persons it would be most desirable to send away, both for their own sakes and for the public good; especially *children*."

THE AMERICANS AND THE WAVE-LINE THEORY.

Mr. Griffiths, the author of an American work on Naval Architecture, to which we some time ago paid our critical respects (see *ante* vol. liv., pp. 404, 483), thus speaks of the wave-line theory in a letter to the *Scientific American:* "Allow me to say that the *eye* and the *model* have been the only channel through which improvements have been conveyed in the United States for the last forty years. American ship-builders have never adopted any theory having for its basis mathematical inquiry—however near they may have approximated the theory of wave lines, in the determination of shape for their ships, it has, without a single exception, been the result of observation condensed into the rotundity on the model by the aid of the eye. The wave-line theory is regarded by ship-builders in this country as being but a partially developed system,—the merely determining the form of any line, or parallel line, of flotation does not define the shape of the vessel; and beyond this we have never learned that any arbitrary law or tangible rule has been adopted, even by Mr. Russell himself; hollow water lines on both ends of the model have been built for thirty years in this country, and I have in my possession French drawings of vessels which have been built from, and which are from thirty to forty years old, with a large amount of hollow in the water-line, both forward and aft, and but for their limited length, would rival our clipper ships of the present time: here was the great secret of success the French enjoyed in their navy history over that of the English, in point of speed, until recently. The yacht *America* is but an approximation to the theory of Mr. Russell; and if in her determination of a shape a theory has been resolved—a problem has been solved—it is of American, and not English origin. I speak advisedly when I say that her builder knew nothing of the theory of Mr. Russell when her model was made; and having investigated her peculiarities, I know that they do not conform to the theory of wave-lines as discovered by Mr. Russell."

LAKE'S PATENT SYSTEM OF CANAL NAVIGATION.

(Continued from page 4.)

WE now give the figure (fig. 6) referred to in the article in our last Number, and conclude our extracts from Mr. Lake's specification, with a description of the method which that gentleman proposes to adopt for working inclined planes on canals:

Specification.

Locks are usually only of sufficient magnitude to admit the passage of one or two boats at a time; but, as considerable delay would arise to the passage of a long train of boats by passing them through the very largest locks, I propose to supersede locks altogether by means of an inclined plane or planes, of such a construction that it will allow of a train of boats being worked from one level to another by the same engine, which is used for propelling them along the level portions of the canal or river; thus rendering unnecessary any stationary power for that purpose.

Figs. 7 and 8 show a plan and elevation of an inclined plane of this description, with a train of boats passing over; and fig. 9 a cross section of the same. The engravings show a strong timber framing, upon which, at intervals of about 10 feet, are fixed two rows of stout travelling rollers *a a*, figs. 7, 8, 9, and 10, two or three feet in diameter, working in proper bearings or plummer blocks *b b*. These rollers may have any rate of inclination given to them from the foot of the plane at A to its summit at B that may be considered most suitable, but the contour of the plane at its upper part, near the summit, should be such a curve as will admit of the easy transfer of the boats from one level on to the other. I prefer an inclination of about 1 in 25 for these inclined planes.

For working over these fixed rollers, the bottoms of the boats will be provided with two stout strips of iron *c c*, fig. 9, secured or riveted thereto, which will act as rails, and will rest upon the rollers *a a* during the passage of the boats over the inclined planes.

The rollers *a a* are continued under the water levels of the upper and lower pounds down to the bottom of the canal, as shown at fig. 8. As the adhesion or bite of the driving wheels on a rail with a plain surface would not be sufficient to enable the engine to mount these inclined planes with a heavy load, I propose to obtain a sufficient fulcrum for this purpose by laying down on the walings two stout toothed racks *v v*, into which two pinions *h h*, connected with the shaft of the driving wheels, may work. Any number of pinions may be made to work into these racks; and so any degree of hold or fulcrum that is required may be obtained.

At the upper part of the plane D, these racks would be continued on walings lying about 18 inches above the upper water level for a considerable distance, so that the tooth pinions may remain in action till the last boat of the train has mounted to the summit of the plane, or nearly so. The plain driving-wheels B′B′ working on the plain rails will then keep the pinions engaged to the proper depth in the racks.

To prevent accidents, in the event of the couplings failing, &c., during the ascent of the inclined planes, strong palls may be made to work into the racks from each sides of the boat which contains the engine, and also from every second or third boat of the train if requisite. In the descent of the planes, a powerful brake, fixed on the engine-shaft, will be made use of, and a brake also might be attached to the last boat of the train, which would be under the control of a guard.

The manner of working a train of boats over these inclined planes will be exceedingly simple, and the rate of travelling will be only limited by the power of the engine used.

On arriving at the foot of the plane, the tooth pinions will become engaged with the racks, and no stoppage whatever of the train need take place. When the last boat in the train has arrived at the summit of the inclined planes, the engine will then propel with the plane wheels, which will rest on the walings in the upper pound or level.

In cases where the canal locks come near or close together, or where there is a succession or "flight" of locks, these inclined planes may be made continuous for any distance required, so that any heights may be overcome.

In some cases, particularly with passenger boats, it may be desirable to carry a


Fig. 8.


Fig. 7.

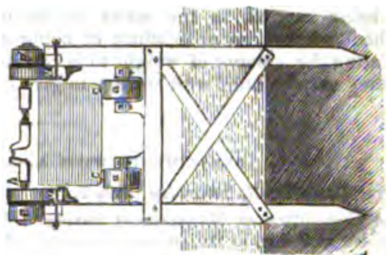


Fig. 9.

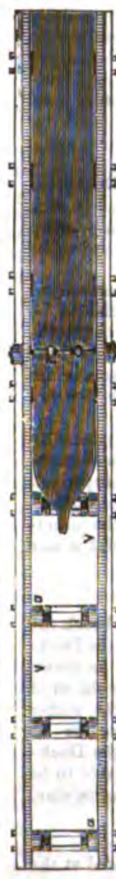


Fig. 10.

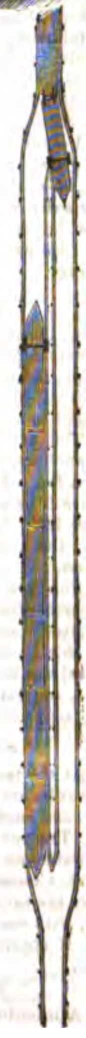


Fig. 6.

portion of the weight of each boat upon the rails of the trackway by means of wheels (as shown in fig. 11), the other portion of the load, and the boat floating and being carried in the water in the usual manner. These wheels may be attached to levers, so as to admit of being raised or depressed, for the purpose of regulating the amount of weight to be carried by the rails and water respectively, and they may be fitted with springs to give ease of motion.

EXPERIMENTS WITH ANCHORS AT SHEERNESS.

First Day's Trial, Thursday, July 1.

The Committee of Management having assembled at 9 A.M. in the office of Captain C. Hope, Superintendent of the Dockyard, the following suggestions for the proper qualities of a good bower anchor, as also the conditions and plans on which the trials were to be conducted, were read over to the competitors, and assented to:

"Proper qualities for a good bower anchor; viz., Strength; holding, particularly when at a short stay, and being obliged to make sail; weight, and facility for stowage; quick holding; sweeping; tripping; fouling; fishing in a heavy seaway, and stowing.

"*First Trial Plan.*

"At the testing-ground in the Dockyard. A fourfold purchase to be attached to each anchor, the falls to be toggled to a pendant and jewel-block, with one purchase to be brought to a capstan.

"The testing-ground to be marked for the anchors, and their turn for trial to be drawn for. From the capstan those to the right will be marked 'Starboard,' and those to the left 'Port.' Numbers to commence from the extreme ends of the testing-ground.

"The pee of the anchor to be placed in its berth according to the number drawn, and after testing their burying properties, the cable (being already rove in the testing-blocks) are then to be triced to the sheer-heads, to test the holding qualities with a short scope of cable.

"*Second Trial Plan.*

"At the testing-ground on the beach the same rules are to be observed as in the Dockyard, and another turn for trial to be drawn for. The pee of the anchor to be placed at low water-mark, if agreeable to the wishes of the Committee; the purchase to be nearly the same as that used in the Dockyard, with one capstan. Hemp cable to be used, if sheers are required; if otherwise, chain.

"*Third Trial Plan.*

"A mooring lighter to be moored at the Little Nore, her rudder to be unshipped, the bridles to be of hemp, attached to the moorings, to be taken in over the stern with a sufficient length of veer, if required, 30 or 40 fathoms; the size of the cable to be 15 inches; the moorings to be laid across the tide, in order that the trials may take place with the flood or ebb tide. Another turn for trial to be drawn for.

"*Fourth, or Steam Trial, as per Plan.*

"A steamer of not less than 300-horse power to be used; both anchors for testing to be let go at the same time, the depth of water and the speed of the steam (to go with a back turn) agreeably to the wishes of the Committee."

The following Resolutions, determined on at a previous Meeting of the Anchor Committee, were then submitted to the parties assembled:

"1. That the Committee approve of Mr. J. Aylen's plan for trying the anchors in the Parade-ground of the Dockyard, on the beach, under water, and at sea, and that the same be adopted.

"2. That the trials be open to anchors of all nations. That the weight of each anchor be 25 cwt., inclusive of the stock.

"3. That such of the anchors as the Committee shall consider to have proved themselves superior at the preliminary tests should be afterwards subjected to such further ones as the Committee may decide on by means of two steamers at sea, with reward to holding, bringing-up, and tripping."

These preliminaries having been concluded, the parties proceeded to the Parade-ground, which was prepared with apparatus and gear designed by Mr. J. Aylen, Master-Attendant, by which ingenious process no preference could be given or deception practised. The owners of the anchors then drew lots for the respective stations, port and starboard, which terminated in the following manner:

Starboard.

1. Mr. Honibal (patentee of Porter's anchor.)
2. Mitcheson and Son.
3. Lieutenant Rodgers, R.N.
4. Mr. G. W. Lennox.

Port.

1. Mr. J. Aylen, Master-attendant.
2. Mr. Isaacs (American anchor.)
3. Mr. Trotman (improved Porter's.)
4. Admiralty (new.)

The gear being affixed to the anchors, the testing commenced. In accordance with the above arrangements, Honibal's anchor, total weight 24 cwt. 3 qrs. 20 lbs., was opposed to Aylen's, of 24 cwt. 2 qrs. 24 lbs. At a long scope of cable, Aylen's came home 3 feet 7½ inches; Honibal's, 1 foot 6 inches.

The position of the gear being changed, so as to have the effect of a ship riding at a short-stay peak, Aylen's broke out of the ground at 9 feet 7 inches, or 13 feet 2½ inches total distance from first position, Honibal's holding on, settling 2½ inches only.

Mitcheson and Son's anchor, weighing 25 cwt. 8 lbs., was then tried against Isaac's American anchor, of 25 cwt. 17 lbs. At long scope of cable, Mitcheson's dragged 1 foot 6 inches; Isaac's, 5 feet 7 inches. At short-stay peak, Isaac's was lifted out of the ground at 11 feet 6 inches total distance from first position, Mitcheson's holding on at 1 foot 8½ inches total distance.

The two next anchors tested were Trotman's improved Porter's, and Lieutenant Rodgers's, R.N., Exhibition prize anchor, the total weight of the former being 25 cwt. 6 lbs., that of the latter 24 cwt. 2 qrs. 22 lbs. Rodgers's drew 5 feet; Trotman's, 3 feet 7½ inches. Rodgers's came out of the ground at 18 feet total distance, Trotman's drawing only 2½ inches, holding on at 3 feet 9½ ins., total distance from first position.

The anchor invented by Mr. G. W. Lennox, the contractor for cables and anchors used in the Navy, was then tried against the Admiralty anchor, constructed on Sir W. Parker's plan. Their weights were 24 cwt. 1 qr. 25 lbs., and 25 cwt. respectively. At long scope, Lennox's drew 2 feet 7½ inches; the Admiralty, 1 foot 6½ inches. At short-stay peak, Lennox's broke out of the ground at 17 feet 11 inches, the Admiralty's having drawn a total distance of 10 feet 8½ inches. This concluded the first day's experiments, leaving the four best anchors to be tested against each other.

Second Day's Trial, Friday, July 2.

The experiments were resumed this day, at 9 A.M., Honibal's being opposed to Mitcheson and Son's anchor. At long scope, Mitcheson's dragged 5 feet 6 inches; Honibal's, 4 feet 4½ inches. At short-stay peak, Mitcheson's came out of the ground at 24 feet 4½ inches, Honibal's dragging 6 feet 8½ inches total distances.

The next contest was between the Admiralty and Trotman's anchors. The former, at long scope, drew 6 feet 8 inches, the latter 4 feet 10½ inches. At short-stay peak, the Admiralty anchor was forced out of the ground at a total distance of 22 feet 10 ins., Trotman's drawing 9 feet 11 inches, but still holding on.

The eight competing anchors were now reduced to two; viz., Honibal's and Trotman's, to contest for superiority. These partaking of the same principle, the greatest possible interest was evinced by the Jury and all assembled as to the result of the trial. Honibal's, at long scope, drew 5 feet; Trotman's, 6 feet 5 inches. After a most severe contest at short-stay peak, the great strain applied making the blocks and gear creak, Honibal's was eventually wrenched out of the ground at 16 feet 6 inches total distance, as against 10 feet 2 inches for Trotman's, which held on.

These represent bower anchors, combining the two great essentials—strength and holding power.

Lieutenant Rodgers, R.N., having sent in an anchor, which he designates a stream kedge, possessing holding power without sufficient strength, the Committee at the onset considered it ineligible for trial. Lieutenant Rodgers, however, evincing great anxiety that it should be tried against Trotman's, which had in this series of experiments proved itself the most efficient, the Committee appealed to Mr. Trotman on the subject, who forthwith accepted the challenge.

The following result of the trial, in our opinion, confirms more fully the great superiority of Trotman's principle over that of Lieutenant Rodgers:

The anchors being placed port and starboard respectively, the gear attached, and strain applied, Rodgers', at long scope, dragged 7 feet 8½ inches; Trotman's, 6 feet. At short-stay peak, Rodgers' was pulled out of the ground at 24 feet 6 inches; Trotman's holding on at 9 feet 1 inch—total distances from first position. This terminated the second day's trial.

Third Day's Trial, Saturday, July 3.

The experiments were renewed this day at 9 A.M., by placing Mitcheson and Son's anchor in competition with the Admiralty new one. The strain being applied, Mitcheson's, at long scope, drew 1 foot 6½ ins.; the Admiralty's, 8 feet 7 inches. At short-stay peak, the Admiralty anchor was lifted out of the ground at a distance of 14 feet 9½ inches from its first position, Mitcheson's firmly holding on, and not dragging the least.

The great confidence of Mr. Trotman in

the efficiency of his anchor, weighing 25 cwt. 0 qr. 8 lbs., induced the Committee to allow it to be tested with one of the new Admiralty anchors, weighing 30 cwt. 1 qr. 17 lbs. At long scope, the Admiralty anchor was drawn 3 feet 10 inches, and Trotman's 6 feet. At short-stay peak, the Admiralty anchor came out of the ground at 19 feet 3 inches total distance from first position, Trotman's having only moved one inch, thus having drawn its opponent 15 feet 5 inches.

Mitcheson's anchor was then tested with Rodgers' stream kedge. At long scope Mitcheson's dragged a distance of 6 feet 4½ inches, while Rodgers' drew 7 feet 7 inches. At short stay peak Rodgers' was lifted out of the ground at 24 feet total distance, Mitcheson's holding on at 6 feet 9 inches, having moved only 4½ inches, or a total distance of 6 feet 9 inches.

The next and last trial of this day then took place, by opposing Mitcheson and Son's anchor to that of Mr. G. W. Lennox. At long scope Mitcheson's dragged 4 feet, Lennox's 7 feet 11 inches; the latter, at short stay peak, was wrenched out of the ground at a total distance of 22 feet 4½ inches, Mitcheson's holding on at 6 feet total distance, having dragged its opponent 14 feet 5½ inches.

So far as the trials have gone, it would appear that the three best anchors are Trotman's, Haniball's, and Mitcheson and Son's, in the order here placed. The Committee, however, have very properly determined not to give any opinion as to their merits until the whole series of experiments are concluded.

As soon as the tides will permit, and the necessary arrangements are completed, the second series of trials will take place on the beach at Garrison Point.—*Times.*

EXTENSION OF PATENT.

PRIVY COUNCIL, Monday, July 5.

(*Present — Mr. Justice* PATTESON, *Dr.* LUSHINGTON, *and Sir* EDWARD RYAN.)

BERRINGTON'S KNAPSACK.

This was an application to their Lordships to extend the term of the patent granted, in 1838, to Mr. Berrington, for an improved knapsack.

Several witnesses were examined, from whose testimony it appeared that Mr. Berrington's knapsack possessed several advantages over what is termed the "regulation" knapsack, the principal of which were that the weight was thrown on the transverse plane of the body, the respiration remained unimpeded, and the arms were free. There had been several trials made of it in the army, and in every case with success, the reports of the officers having been highly favourable. It was stated that, from its peculiar construction, it would act as a float, and the probability was, that if the men on board the *Birkenhead* had been furnished with it their lives would have been preserved. Mr. Angelo, who instructs the army in sword exercise, deposed that nine out of ten of the infantry became flat-chested, which he attributed in a great degree to the regulation knapsack. Mr. Berrington was examined, and stated that he had expended some hundreds of pounds on his patent, but had never derived any returns. He had reason, however, to hope that, if the patent were extended, his knapsack would be adopted in the army.

Mr. Knowles and Mr. Webster appeared for Mr. Berrington, and Mr. Welsby for the Crown.

Dr. Lushington said that their Lordships felt some surprise, after the testimony which had been given in favour of Mr. Berrington's patent, that so great a lapse of time should have taken place (fourteen years) without the knapsack being adopted in any one of her Majesty's regiments. It would lead their Lordships to doubt the value of the invention, but as there was no evidence to show that it failed in attaining its object, they would recommend an extension of five years, under the hope that its utility would be ascertained, and if so, that there would be no delay in introducing it into the army, which it appeared so well calculated to benefit.

THE WIRE ROPE PATENT.

COURT OF QUEEN'S BENCH.—Monday, July 5.

(*Sittings at Nisi Prius, at Guildhall, before Lord Campbell and Special Juries.*)

NEWALL *v.* WILSON.

The Attorney-General, Mr. Crowder, Mr. Serjeant Channell, Mr. Mellor, Mr. Denison, and Mr. Webster were counsel for the plaintiff; and Sir A. Cockburn, Mr. M. Chambers, Mr. Bramwell, and Mr. Hindmarch for the defendant.

By the pleadings it was stated that the plaintiff was the inventor of certain improvements in wire ropes and of machinery for making such ropes; that he had a patent dated August 7, 1840; and the defendant was charged with having infringed that patent.

The defendant pleaded that the Crown did not make the grant, that the plaintiff was not the first inventor, that the invention was not new, that the specification was insufficient, that the specification was not

duly enrolled, and the defendant added that he was not guilty.

About half an hour was occupied in private conferences between the counsel and the parties.

The Attorney-General, addressing the jury, said he was happy to state that they would have no further trouble than merely to deliver a verdict for the plaintiff, the parties having wisely arranged the matter. This was a patent for making wire rope, which the plaintiff had taken out in 1840, and which certainly was a most useful and important invention. The defendant had also taken out a patent. There were now only two years to run of the plaintiff's patent, and the defendant had consented to take a license from the plaintiff for the two years. It was highly desirable that there should be no further litigation.

Sir A. Cockburn said his learned friend had truly stated that the parties had come to terms, and that the Jury would not be further troubled.

Lord Campbell said that under the wise advice of their counsel, the parties had come to a most rational and proper arrangement.

Verdict for the plaintiff.

HAYWARD *v.* POTTER.

Mr. Bramwell and Mr. Lush were counsel for the plaintiff, and Mr. Crowder and Mr. Hawkins for the defendant.

This was an action for an infringement of a registered design for paper-hangings. It was a question upon the construction of the Registered Design Act, 5th and 6th Victoria, c. 100, s. 4, which directed that no person should be entitled to the benefit of the Act unless upon every article registered there should be placed the letters "Rd." (registered). Certain small lengths were cut from the piece of twelve yards which was so marked, and these were sent to the retail traders as patterns, but were not marked. The point, therefore, was whether under the Act such patterns ought to be stamped.

It was arranged that upon these admitted facts the verdict should be entered for the plaintiff, subject to the opinion of the Court above upon the construction of the section of the Act of Parliament.

There being some little question as to the practice of sending out patterns stamped or not stamped, witnesses were called on both sides upon that point.

Lord Campbell put it to the Jury whether or not it was the general, although not the universal practice, to stamp patterns?

The Jury found it was the general practice to stamp patterns.

His Lordship then said that he should hold that the action was not maintainable, and the verdict should be entered for the defendant, with leave for the plaintiff to move.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JULY 7, 1852.

CHRISTOPHER NICKELS, of York-road, Lambeth, and THOMAS BALL and JOHN WOODHOUSE BAGLEY, both of Nottingham. *For improvements in the manufacture of knitted, looped, and other elastic fabrics.* Patent dated December 24, 1851.

The improvements claimed under this patent have relation,

1. To machinery for producing knitted fabrics.

2. To machinery for producing warp fabrics with transverse threads at both sides of the fabric.

3. To looms suitable for weaving narrow elastic goods.

4. To the manufacture of elastic fabrics, with a terry, or fleeced terry, or cut-pile surface and a waterproof surface.

5. To the covering of strands of India-rubber, or other material with a looped-knit fabric.

JOSEPH STENSON, of Northampton, engineer and iron manufacturer. *For improvements in the manufacture of iron, and in the steam apparatus used therein; part or parts of which are also applicable to evaporative and motive purposes generally.* Patent dated December 27, 1851.

Claims.—1. The treating and mixing of materials so as to produce certain combinations described, as an improvement in the manufacture of iron.

2. The employment and adaptation of double jet tuyeres to blast furnaces. Also, the employment and adaptation of hoppers to the blast pipes of furnaces for applying carbonaceous matters.

3. The construction of a pile of a combination of a series of narrow bars arranged and disposed in a peculiar manner described. Also, the constructing piles according to several arrangements described.

4. The welding such piles by hammering them immediately on leaving the mill furnace, and previous to being rolled into the finished bar.

5. Certain steam generators and boilers constructed in a peculiar manner described when used as auxiliary boilers in connection with reverberatory furnaces. Also, certain other steam generators and boilers, whether used for supplying steam to the engine or engines by which motive machinery of iron works is or can be worked, or whether used

for evaporative and motive purposes generally.

Annet Gervoy, of Lyons, Director of the Lyons Railway. *For means to prolong the durability of the rails on railways.* Patent dated February 13, 1852.

It is well known that the wrought iron rails of railways, after having been in continued use, become weakened, and lose their fibrous structure, assuming instead a crystalline character. Now the patentee proposes to prolong the durability of such rails by taking them up after having been in use and submitting them to heat, so as to restore fibrousness to the iron. The intervals at which it will be necessary to take up the rails will depend on the traffic to which they are subjected. For the purpose of heating the rails, the patentee employs a furnace divided into two compartments; and while the rails in one compartment are being heated to a red heat, those in the other are allowed to cool. When cooled down they are removed from the furnace, and replaced on the line of railway.

Claim.—The means described of prolonging the durability of rails used on railways.

Francis Hastings Greenstreet, of Albany-street, Mornington-crescent. *For improvements in coating and ornamenting zinc.* (A communication.) Patent dated December 31, 1851.

These improvements consist in coating and ornamenting zinc or zinced surfaces by means of acids, alone or combined with other matters capable of acting chemically on the surfaces. The solutions used may be applied by sprinkling, dabbing, spreading, or marbling; and the surfaces coated are capable of further ornamentation by painting, which may be done with common oil colours. Among the preparations which the patentee recommends for coating and ornamenting zinc or zinced surfaces, are the following:

1. Muriatic acid diluted with water to a strength of about 1·114. The coating produced by this solution is of a light ash-colour.

2. Chrome yellow, ground fine with soft water, and mixed with preparation 1 to a liquid consistence. This gives a yellowish grey colour.

3. The pigment known as "mountain or Saxony green," mixed gradually with preparation 1 to a thin paste, and stirred till effervescence ceases. This produces an iron grey colour tinged with green.

4. White lead, ground fine with soft water, and mixed with preparation 1, produces a grey coating. Where expense is not an object, Kremnitz white may be used instead of the white lead.

5. Flour of sulphur ground fine with water and mixed with preparation 1. This mixture gives a yellowish white coating.

6. Butter of antimony may be mixed with the before-mentioned preparations. When used alone it produces a black colour, but when mixed, does not affect the colour of the preparation with which it is used. It produces a good ground for subsequent painting or other application.

7. Butter of antimony diluted with distilled water. This produces a fine coating, resembling in colour Indian ink.

8. Butter of antimony mixed with spirits of turpentine. This preparation, when applied alone, produces a black colour; it may have pigments of different kinds mixed with it, and the effect will then vary according to the nature of the colour employed.

The surfaces after having been coated by the means above mentioned, and further ornamented, if thought desirable, should be protected by a coating of varnish. Copal varnish may be used for this purpose; but the patentee recommends the use of wax, or mixtures containing wax, as this substance is an effectual preservative against oxidation, and easily renewed or kept in good condition.

In conclusion, the patentee wishes it to be understood that he makes no claim to the use of nitrate or muriate of copper which have been known and employed for printing on zinc, but he claims

The modes described of coating and ornamenting zinc and zinced surfaces by compounds acting chemically on the surfaces.

Robert Beck Froggatt, of Sale Moor, manufacturing chemist. *For improvements in the preparation of certain compounds to be used for the purpose of rendering woven and textile fabrics, paper, leather, wood, or other materials or substances waterproof and fireproof, and also in machinery or apparatus employed therein.* Patent dated December 31, 1851.

1. The patentee prepares his compositions for waterproofing and fireproofing by combining in different proportions, according to the nature of the articles treated and the uses to which they are to be applied, the following chemical and other substances: First, graphite, prepared by burning 10 parts of iron filings with 90 parts of carbon for about ten hours. Second, animal or vegetable matters, such as gluten, glue, gum, resin, mucus, or other similar substances, dissolved in water. Third, blood, the serum of which is separated from the crassamentum by the application of gentle heat. Fourth, protosulphate of iron dissolved in water, or the basic red sulphate of iron, double sulphate of alumina and pot-

sals, or hydrochlorate of ammonia. Fifth, oxygenated oil or fatty matters. These ingredients are applied in various proportions to the substances to be treated. When pliability is not an object, the oil or fatty matters need not be used.

2. The patentee describes an arrangement of apparatus for impregnating fatty and oily matters with a stream of oxygen gas, and for separating their impurities.

Claims.—1. The several combinations, compositions, or compounds of chemicals described for rendering woven and textile fabrics, and other articles or materials waterproof and fireproof, or waterproof only.

2. The apparatus for impregnating oils or fatty substances with oxygenated gas, and for purifying such substances.

George Gwynne, of Hyde Park-square, Esq., and George Fergusson Wilson, managing-director of Price's Patent Candle Company, Vauxhall. *For improvements in treating fatty and oily matters, and in the manufacture of lamps, candles, night-lamps, and soap.* Patent dated December 31, 1851.

Claims. — 1. The employment of heat above 360° in the acidification of fatty matters when such acidification is not performed in the still.

2. The distillation in an atmosphere of steam, or other suitable gaseous body, of acidified matters which have, after the acidification, been treated with lime or some substituted agent.

3. A mode of adding fatty matters to the lime in the process of saponification, instead of adding the lime to these matters.

4. The use of sulphurous acids for separating the fatty acids from soaps, and also for separating bases from the fatty acids.

5. The use of sulphurous acid when combined with another acid, for separating the fatty acids from soaps.

6. The treating of fatty acids with sulphurous acid, and also with ammonia and sulphurous acid, combined or free.

7. The use of sulphurous acid, or some substituted agent, for the purification of such fatty matters as have been previously acted on by nitrous fumes and the use of lime water, or some substituted agent, when followed by the use of an acid for the same purpose.

8. The use of atmospheric air, or some substituted agent, for operating on such fatty matters as have been previously acted on by nitrous fumes.

9. Agitating fatty matters by atmospheric air, whether its oxygen be combined or free.

10. The use of atmospheric air for acting on such fatty matters as have been acted on by chemical agents.

11. The use of sulphurous acid obtained by combustion (as a substitute for other acids) for operating on fatty matters.

12. The distillation of soaps in an atmosphere of steam.

13. The use of the lamp described for burning rosin oil, which has been distilled in an atmosphere of steam. (This lamp combines the principles of the "Fountain" and "Camphine" lamps, and embodies the arrangements of the former for the supply of oil, and of the latter for preventing the emission of smoke.)

David Napier, of Millwall, engineer. *For improvements in steam engines.* Patent dated December 31, 1851.

These improvements have relation to rotary engines of the class in which the power is obtained by a cylindrical drum revolving eccentrically within a cylinder, the steam abutment being formed by a slide or piston moving in and out through a slot formed in the outer cylinders. The novelties consist: 1. In taking off the pressure from the slide by means of a parallel motion and radius rods, or by rollers between the sides of the slide and other smooth metallic surfaces; 2. In working the slide by means of eccentrics fixed on the main shaft,—the throw of the eccentrics being exactly equal to the diameter of the internal cylinder; 3. In fitting a movable joint to the foot of the slide, so as to keep it constantly in steam-tight contact with the internal cylinder at all points of its revolution; 4. In a mode of packing the ends of the internal cylinder, by means of split rings of steel, one of which is compressed into an angular groove formed in each end of the cylinder, the elasticity of the steel ring giving it a constant tendency to press outwards, and thus forming a steam-tight joint between the meeting surfaces; 5. In fixing the internal cylinder on to the main shaft, and making one side of that shaft to form a portion of the periphery of such cylinder, instead of fixing the shaft wholly inside of such cylinder.

In conjunction with the above improvements, the patentee proposes the use of tubular fire-bars for the boilers, one end of the fire-bars (which are placed in an inclined position) being in communication with the water-spaces of the boiler, and the other being provided with a cock for clearing out the tubes as often as necessary. He also proposes to fit a fan in the engine-room of steamers, and thus produce a current of air which will have the effect not only of keeping the engine-room cool, but of increasing the draught to the fires; and further describes an arrangement whereby both the engines of a steamer may be stopped, started, or reversed by a single movement of a slide.

In conclusion, Mr. Napier says—"In case there may have been some of these things, unknown to me, done already, I therefore propose claiming not only for the parts separately, but the combination."

FRANCIS CLARK MOUATIS, of Earlstown, Berwick, builder. *For an improved hydraulic syphon.* Patent dated December 31, 1851.

The nature of this invention will be readily seen from the claims, which are for—

1. The connection of a force pump with a syphon, for raising water.

2. An improved construction of double valve used in the above apparatus.

ARAD WOODWORTH, 3rd, and SAMUEL MOWER, of Boston, United States. *For improvements in machinery for manufacturing bricks, tiles, or other articles of similar character.* Patent dated January 24, 1852.

The present improvements have relation to machinery for the manufacture of bricks, tiles, &c., in which percussion is used to consolidate the plastic materials in the moulds. The patentees claim as their invention—

1. The combination of a percussion ram and its piston or pistons (whether in connection or separately) with a mould or moulds, and a lower expulsion piston or pistons, made to operate so as to compress the clay or plastic material in, and afterwards expel it from the moulds. And in combination therewith, or auxiliary thereto, machinery for elevating the lower piston or pistons in the mould or moulds, in order to produce direct compression on the lower face of the article in the mould.

2. The construction and use of a sliding mould-charger in connection with the ram and piston or pistons, in such manner as to render it a part of the mould during and for some time after a percussion of the ram.

3. The construction of the moulds with flaring or inclined sides, and the combination therewith of mechanism for lifting the moulded article a short distance before the second percussion, so as to free the moulded article of its adhesiveness to the mould, and permit the compressed air to escape.

4. The combination with the percussion ram and its auxiliary contrivances of additional machinery, to produce compression of the top surface of the brick.

5. The construction of the orifices of the mould-charger with sides inclining inwards towards each other as they descend.

6. The combination of an adjustable striker with the mould-charger and hopper, for striking off at any required point the top surface of the clay deposited in the mould-charger.

7. The combination with such adjustable striker of mechanism to cause it to rise up as the mould-charger moves forward, for the purpose of leaving the clay higher at the back than at the front part thereof, in order to obviate the difficulty of the clay being more condensed in the front than in the rear part of the charger when its back movement is made.

GEORGE COLLIER, of Halifax, mechanic. *For improvements in the manufacture of carpets and other fabrics.* Patent dated December 31, 1851.

The improvements claimed under this patent are exceedingly numerous, and relate—

1. To combining apparatus to facilitate the introduction of wires for producing looped or terry weaving in the manufacture of carpets and other fabrics.

2. To combining apparatus in connection with looms constructed to weave carpets and other fabrics with cut or velvet pile.

3. To combining apparatus in connection with looms, in order to facilitate the introduction of wires for weaving carpets and other fabrics with terry pile by power.

4. To various improvements in connection with looms for the production of what are called "Brussels" carpets, and other like piled fabrics; and also to the Jacquard apparatus employed in combination with looms for producing such fabrics.

5. To apparatus for cutting the pile of carpets and other fabrics to produce cut or velvet pile.

6. To apparatus employed in winding and doubling yarns to be used in weaving carpets and other fabrics.

RECENT AMERICAN PATENTS.

FOR AN IMPROVEMENT IN MILLS FOR GRINDING QUARTZ. *Smith Crem.*

My quartz crusher and grinder consists mainly of a horizontal annular trough, and of two vertical crushing wheels, which are caused to rotate in the trough, and at the same time to revolve around a central axis.

Claim.—What I claim as my invention is, the crushing and grinding mill herein described, consisting of a trough and one or more rotating wheels, the acting surfaces of both the wheels and trough being formed as herein set forth, so that the former will run in the latter, without tendency to run over its edges, except as it may be influenced by centrifugal force.

I also claim the combination of a double ridged wheel-rim, with a trough of corresponding form, whereby the lumps of quartz or other substance being ground are grasped by the wheel in its rolling between the angular groove or furrow contained between the two ridges, and being thus prevented from

escaping laterally, are crushed upon the ridge of the trough with much less force and greater effect than if the angular action of the ridges was counteracted by the imbedding of the lumps to be crushed, among smaller granular and pulverized particles, which is always the case when the concave or inner angle is below, and the convex or outer angle above, which is the converse of the combination to which this claim refers.

I likewise claim the method of constructing the wheels of a crushing and grinding mill, of removeable sections, substantially in the manner and for the purpose herein set forth.

For an Improvement in Floating Docks. *Orillus T. Williams.*

Claim.—Having thus described my dock, and the various uses to which it is applicable, I will state, that I do not claim forcing air into a vessel immersed or partly immersed in water, for the purpose of rendering it buoyant, or of admitting water, for the purpose of allowing it to sink; but what I do claim as my invention is, so forming a cylindric or prismatic dock as to perform the operation of elevating a vessel above the surface, by combining the buoyancy obtained by injecting air into the cylinders, with the the forced revolution of the cylinders on their axes, while lying on the water, substantially as herein set forth.

2nd. I also claim making the rigid submerged elevator in such a manner as to be actuated by compressed air, only so long as to get rid of the contained water, and to be freed from the interior pressure while sustaining its load above the surface of the water, whereby the liability to accident, from the escape of air under high pressure, is avoided, substantially as herein described.

3rd. I also claim, in combination with a flexible tube for conveying injected air, the use of the revolving pipe directly connected therewith, whereby the pipe may be turned as herein described, for varying the direction of the current of injected air, by turning the flexible tube, as herein set forth.

4th. I also claim, in combination with the flexible tube for the injection of air, the opening in the bottom of the cylinder, and the vents in its top, whereby the dock is rendered buoyant while wholly immersed in water, and freed from interior pressure on rising to its maximum height on its surface, substantially as herein set forth.

5th. I also claim the double parbuckle, or analogous turning apparatus, whether a rope or a chain, with friction rollers in its links, be used for the purpose of turning the opposite elevators in opposite directions, for the purpose of raising the vessel above the water, in the manner substantially as herein set forth.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Richard Hornsby, of Spittlegate, Grantham, Lincoln, agricultural-implement maker, for improvements in machinery for threshing, shaking, riddling, and dressing corn. July 3; six months.

Edward Clarence Shepard, of Duke-street, Westminster, gentleman, for improvements in electro-magnetic apparatus suitable for the production of motive power, of heat, and of light. (Being a communication.) July 6; six months.

Martyn John Roberts, of Woodbank, Bucks, gentleman, for improvements in the production of electric currents, in obtaining light, motion, and chemical products and effects by the agency of electricity, part or parts of which improvements are also applicable to the manufacture of acids, and to the reduction of ores. July 6; six months.

William Tanner, of Exeter, leather-dresser, for improvements in dressing leather. July 6; six months.

Edward Maitland Stapley, of Cheapside, for improvements in cutting mouldings, grooves, tongues, and other forms, and in planing wood. (Being a communication.) July 6; six months.

Moses Poole, of the Patent-office, London, gentleman, for improvements in reaping and mowing-machines, and in pulverizing land. (Being a communication.) July 6; six months.

Thomas Blakey and Joseph Skaife, of Keighley, York, millers, for improvements in mills for grinding. July 6; six months.

James Higgins, of Salford, Lancaster, machine-maker, and Thomas Schofield Whitworth, of the same place, mechanic, for certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances. July 6; six months.

Harold Potter, of Over Darwen, Lancaster, carpet-manufacturer, and Matthew Smith, of the same place, manager, for certain improvements in looms for weaving, and in the manufacture of terry fabrics. July 6; six months.

Jules Lemoine, chemist, of Courbevois, near Paris, for an improved composition applicable to the purposes of varnish, to the waterproofing of fabrics, to the manufacture of transparent fabrics, to the fixing of colours, and to other useful purposes. July 6; six months.

John Henry Johnson, of 47, Lincoln's Inn-fields, Middlesex, and of Glasgow, North Britain, gentleman, for improvements in steam-engines. (Being a communication.) July 6; six months.

Alfred Henry Gaullie, of Paris, sculptor, for an improved plastic composition applicable to manufacturing purposes. July 6; six months.

William Septimus Losh, of Wreay Syke, Cumberland, gentleman, for improvements in obtaining salts of soda. July 6; six months.

James Murdoch, of Staple-inn, Holborn, Middlesex, for an improvement in the manufacture of certain kinds of woollen fabrics. (Being a communication.) July 6; six months.

John Andrews, of Fair Oak-terrace, Minde, Newport, Monmouthshire, contractor, for certain improvements in coke ovens, and in the apparatus connected therewith. July 6; six months.

Frederick Sang, of Pall-mall, artist in fresco, for certain improvements in machinery or apparatus for cutting, sawing, grinding, and polishing. July 6; six months.

Friedrich Gesswein, of Cannstadt, Wurtemberg, stone-mason, for a method of preparing for baking and burning masses of clay of any given form and size, and baking and burning the same when so prepared, as thoroughly and completely as a common brick can now be baked or burnt. July 6; six months.

John Ramsden, of Manchester, screw bolt manufacturer, for certain improvements in machinery or apparatus for cutting screws. July 6; six months.

LIST OF SCOTCH PATENTS FROM 22ND OF MAY TO THE 22ND OF JUNE, 1852.

John Harcourt Brown, of Aberdeen, Scotland, and John Macintosh, of the same place, for improvements in the manufacture of paper, and articles of paper. May 24; six months.

Charles James Pownall, of Addison-road, Middlesex, gentleman, for improvements in the prepa- in the preparation and treatment of flax, and other fibrous and vegetable substances. May 28: six months.

John Weems, of Johnstone, Renfrew, North Britain, tinsmith, for improvements in the manufacture or production of metallic pipes and sheets. May 31; six months.

Alexander Johnson Warden, of Dundee, Forfar, Scotland, manufacturer, for improvements in the manufacture of certain descriptions of carpets. May 31; six months.

Joseph Swan, of Glasgow, Lanark, North Britain, engraver, for improvements in the production of figured surfaces, and in printing, and in the machinery or apparatus used therein. June 10; six months.

George Searby, of Chelsea, Middlesex, decorator for certain improvements in apparatus for cutting and carving metal, stone, and other substances. (Being a communication.) June 11; four months.

John Frearson, of Birmingham, for improvements in cutting, shaping, and pressing metal, and other materials. June 14; six months.

Thomas Twells, of Nottingham, manufacturer, for certain improvements in the manufacture of looped fabrics. June 14; four months.

Andrew Fulton, of Glasgow, Lanark. North Britain, hatter, for improvements in hats and other coverings for the head. June 14; six months.

William Edward Newton, of 66, Chancery-lane, Middlesex, civil engineer, for improvements in machinery for weaving, colouring, and marking fabrics. (A communication.) June 15; six onths.

James Edward Coleman, of Porchester House, Bayswater, Middlesex, gent., for improvements in materials and apparatus to be employed in parts of railways, of engines, and of carriages, and in the application of such materials to those purposes, and to the manufacture of textile and other mechanism. (Being a communication.) June 16; six months.

William Hindman, of Manchester, Lancaster, gentleman, and John Warhurst, of Newton Heath, near Manchester, cotton dealer, for certain improvements in the method of generating or producing steam, and in the machinery or apparatus connected therewith. June 16; four months.

Richard Archibald Brooman, of the firm of J. C. Robertson and Company, of 66, Fleet-street, London, patent agents, "A Reaping Machine." (Being a communication.) June 17: six months.

William Gratrix, of Salford, Lancaster, dyer and printer, for certain improvements in the production of designs upon cotton and other fabrics. June 17; six months.

James Edward M'Connell, of Wolverton, Bucks, civil engineer, for improvements in steam engines, in boilers and other vessels for containing fluids, in railways, and in materials and apparatus employed therein or connected therewith. June 18; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
July 2	3314	H. E. Campbell	Guildford-street	Horizontal gold washing machine.
,,	3315	B. Samuelson	Banbury, Oxford	Part of a lawn mower.
3	3316	W. Dray and Co.	Swan-lane, London Bridge	Combined winnowing and blowing machine.
5	3317	W. Tasker and G. Fowle	Andover, Hants	Convex clod-crusher or press-wheel roller.
,,	3318	J. Duncan	Gresham-street, West	Marquise joint.
6	3319	W. Dray and Co.	Swan-lane, City	Part of a reaping and mowing machine.
,,	3320	F. Barnes	Union-row, Tower-hill	Gold-washing machine.
7	3321	J. Higham	Manchester	Bugle.
,,	3322	R. Garrett	Saxmundham	Manure distributor.
,,	3323	Ransomes and Sims	Ipswich	Spherical locking carriage.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

July 1	440	J. Schloss	Friday-street, City	Pick prevention key.
2	441	C. A. Collingridge	South-street, Brompton	Button hole for shirt-front and wrists.

CONTENTS OF THIS NUMBER.

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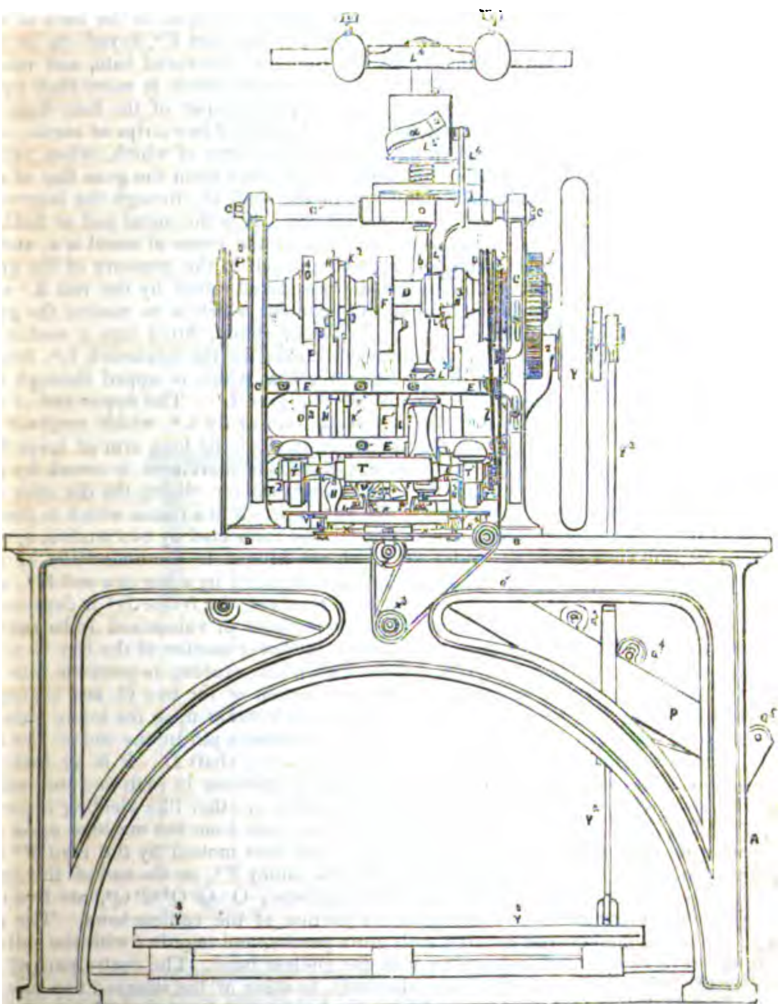
Edited by J. C. Robertson, 166, Fleet-street.

ADDENBROOKE'S PATENT ENVELOPE-MAKING MACHINERY.

Fig. 1.



ADDENBROOKE'S PATENT ENVELOPE-MAKING MACHINERY.

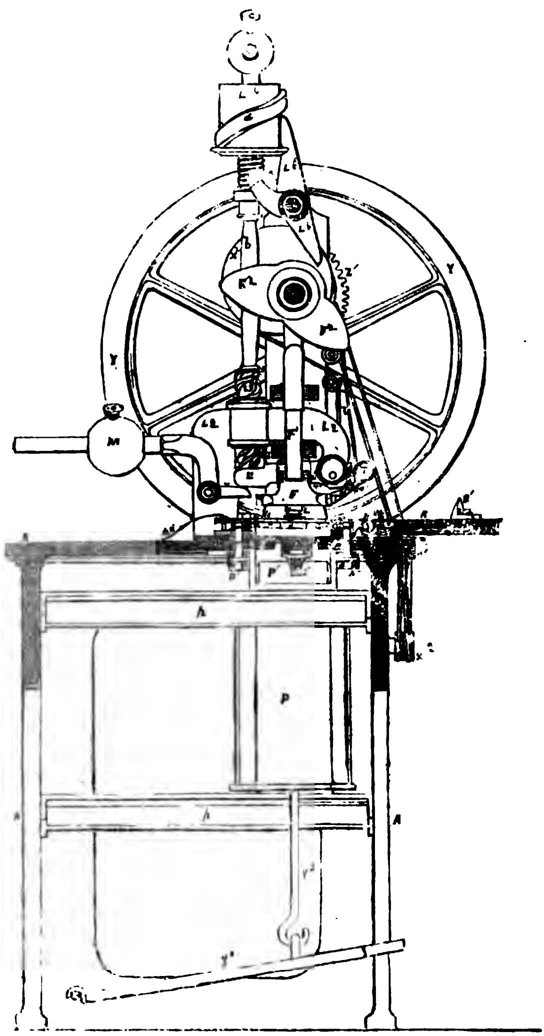
(Patent dated January 8, 1852. Patentee, Mr. Joseph Addenbrooke, of Bartlett's-passage, Holborn, envelope manufacturer. Specification enrolled, July 8, 1852.)

Specification.

MY invention consists in the manufacture of envelopes by means of the improved machinery represented in the engravings. Fig. 1 is a front elevation of a machine constructed according to my improvements, and fig. 2 a cross section; A A is a frame or table, which supports the machine; B is the bed plate, to which the upright bearings, or side frames, C C, are bolted, being united at top by the rod C^1 and nuts *c c;* D is a shaft which is supported by, and turns in, the two bearings C C, and carries a series of cams and eccentrics for actuating the working parts of the machine; E E are two guides, bolted to the bearings C. F is the plunger, which consists of a rectangular frame, the area of which is equal to the back of the intended envelope; it is connected by the rod F^1, to the cam F^2, keyed on to the shaft D, by the revolution of which cam, the plunger is lowered into, and raised out of a rectangular box or recess G, the internal area of which is more than equal in dimensions to the plunger F by the thickness of the paper of the four flaps of the envelope; H is the gum distributor, which is formed of two strips of metal, *a a*, placed at an angle, as represented in fig. 3, the upper edges of which, when raised out of the gum, take up a sufficient quantity to distribute upon the gum flap of the envelope. This gum distributor is connected to the shaft D, through the intervention of the rod H^1 and cam H^2. I is the gum-box; K is the metal pad or holder, which is made of an angular shape, corresponding to the strips of metal *a a*, and is hollowed out on the underside, the better to adapt itself to the pressure of the gum distributor when in contact. This pad is depressed and raised by the rod K^1 and cam K_2, and serves to hold that flap of the envelope which is to receive the gum between it and the gum-distributor; L is a die or stamp, fitted into a socket *z*, upon the lever L^1, one end of which lever is centred in the headstock L^2, firmly bolted to the table A. L^3 is a three-threaded screw, which is tapped through the headstock L^2, and bears upon the free end of the lever L^1. The upper end of the screw is connected by a rod *b*, to the weighted lever or fly L^4, which receives its motion from the drum L^5, connected by the strap *d*, to the long arm of lever L^6, which is centred and turns upon the rod C^1, when the short arm is struck by the cam L^7, keyed upon the shaft D. M is a counterpoise for raising the die after the impression has been given to the flap of the envelope. N is a frame which is placed in the upper portion of the rectangular box G, and connected by two studs *n n*, to a frame N^1, the ends of the two sides of which are hinged to the under side of the bed-plate B, while the end of the frame N^1, is connected by a lug to a rod N^2, and cam N^3, on the shaft D; so that as the cam revolves, the frame N^1 is depressed, and with it also the frame N, which causes four pieces of vulcanized India-rubber tubing *e e*, which are placed between it and D, the lower portion of the box G to be also depressed, and the circumference of the India-rubber tubing to protrude into the area of the box. O is a trap which forms the bottom of the box G, and is hinged to the bed-plate B. O^1 is a lever, one end of which bears upon the lower side of the trap O, while the other end is slotted out to receive a pin in the end of the rod O^3, which is connected at top to the cam O^4, on the shaft D. P is an inclined trough or spout, bolted to the cross-bars *p p*, and supporting in each end the rollers P^1 P^1, over which an endless band of gutta percha, or other like yielding material is passed in order to receive the envelopes as they come from the mashine upon the opening of the trap O. The endless band is put into motion by the cord P^2 P^2, passing over the pulley P^3, on the shaft D, and pulley P^4, on the end of the spindle of the lower roller P^1; P^5 P^6 are guide pulleys; Q^1 Q^2 Q^3 Q^4 Q^5, are five rollers which revolve and bear upon the upper portion of the endless band. The rol- Q^4, Q^5, are formed of iron covered with gutta percha, and together with the rollers, Q^2, Q^3, revolve by fractional contact with the endless band. The centre part of the roller Q^1 is being turned of a lesser diameter, to allow of the stamped flap passing free of the roller, while the outer and larger ends bear lightly upon the two end flaps of the envelope, so as to incline them below the stamped flap until the envelope passes beneath the roller Q^2, when the end flaps are pressed down upon the gum flap and are rendered further secure by again passing beneath the next and heavier

rollers, Q^4, Q^5. The roller Q^1 is driven by a band g from the roller Q^2. R is the feed-table, which is made of a thin plate of cast steel bolted to the general frame-work of the machine, and R^1 R^1, two regulating studs for determining the position of the blank of the envelope on the table. S is a metal roller which is covered with gutta percha, and turns upon centres in the brackets *s s*. The circumference of this

Fig. 2.

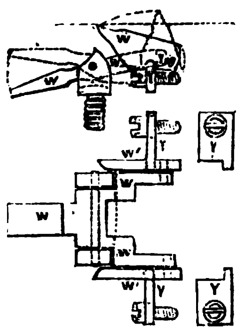


roller, projects slightly through a slot out in the table R. T is a second metal roller also covered with gutta percha, the spindle *t*, of which turns in the arms T^1 T^1, projecting from the rocking studs T^2 T^2. On the end of the spindle *t* is fixed a small toothed pinion *g*, driven by a toothed wheel *h*, which turns in the arms T^1, on the rocking stud T^2; *i* is a pulley made in one piece with the toothed-wheel *h*, by means of which it is caused to revolve when driven by the band *l* from the eccentric

wheel U, on the shaft D. T^3 is a piece of metal of the peculiar shape shown, fastened to the rod *u*, supported by the arms T^1 T^1. This piece, T^3, falls and rises with the feed-roller T. T^4 is a broad metal spring secured by pins to the lower end of the piece T^3. The purpose of this piece, T^3, and spring T^4, is to slightly crease the blank of the envelope along its length while passing beneath them, and thus to ensure its being presented in the proper flat position beneath the plunger. V V are two springs attached to one of their ends to the underside of the feed-table R, while the other ends are united to a cross-piece V^1, in the centre part of which is formed

Fig. 4.

Fig. 5.



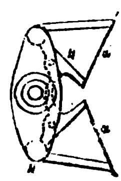


Fig. 3.

an eye *m*, through which the one end of a lever W is passed. This lever W is centred between the brackets *n n*, and bifurcated or divided into two parts, as represented in the side view in fig. 4, and in fig. 6. W^1 W^1 are two adjusting fingers, centred upon pins in the plates *y y*, which have slots y^1 y^1, cut in them to receive pins which project out from the forked ends of the lever W. X is a strip of metal which is fastened to the underside of the springs V V, by the screws *r v*, and to which, at the centre part is fixed the pulley X^1, over which a cord passes from the eccentric X^2. X^3 X^4 are guide pulleys. The purpose of these adjusting fingers is to prevent the blank of the envelope when fed into the machine from being thrown back by impact against the stops at the back of the machine, and also to adjust the blank accurately beneath the plunger F. Y is the fly-wheel, on the outer end of the shaft of which is keyed the crank Y^1, connected by the rod Y^2, to the treadle Y^3, by which the whole machine is set in motion. Z is a pinion on the shaft of a fly-wheel, which gears into the toothed wheel Z^1 on the shaft D.

The mode of operation is as follows:

The attendant first puts the machine into motion by means of the treadle Y^3; he then places upon the feed-table R a blank of the intended envelope, adjusting its position by the regulating studs R^1 R^1. The rotation of the shaft D, and with it the cams and eccentrics, then causes the upper feed-roller T, by means of the eccentric U, to be brought down upon the lower roller S, upon which one of the end flaps of the envelope is placed. The roller T being in rapid revolution, causes the envelope to be projected forward by frictional contact with the roller S, when the end of it comes against the stops on the frame N, where it is retained in its proper position beneath the plunger, partly by the small spring a^1, and partly by the fingers W^1 W^1, which are at this instant made to rise above the feed-table R by the eccentric liberating the springs V V. The fingers have till this time been in the recumbent position, and kept beneath the table by the eccentric drawing down the springs V V to allow the blank of the envelope to pass freely over them. The roller is then drawn up by the full side of the eccentric U, and at the same time the cam L^7 strikes the lever L^6, which, by means of the strap *d*, causes the drum L^5 to partially rotate, and with it the fly L^4 and screw L^3, which, acting upon the lever L^1, causes the die L to be brought down upon the stamp-leaf of the envelope with a smart blow, which leaves an impression upon it of such device as may be engraved upon the die. After the blow has been struck, the counterpoise M restores the whole of the stamping parts to their normal position. Simultaneously with the operation of stamping, the opposite leaf of the blank is gummed by means of the cam H^2 raising (through the

intervention of the rod H^1) the gum distributor H from out of the gum—the edges of the strips *a a* taking up a sufficient quantity to distribute upon the leaf. During the raising of the gum distributor, the pad or holder K is being lowered by the cam K^2 and rod K^1 until the under surface of the pad comes into contact with the strips *a a* of the gum distributor, but having the gum-leaf of the envelope between them. The gum distributor is then lowered, and the holder raised clear of the blank of the envelope when the plunger F begins to descend by the action of the cam F^2, and forces the blank into the rectangular box G, which causes it to be creased into the shape of the intended envelope, but with the flaps at a right angle to the back; the plunger then rises clear of the box G, and the frame N, by means of the cam N^3 and rod N^2, is brought down upon the four pieces of India-rubber tubing *e e*, which causes them to be protruded into the box G, and gives to the flaps of the envelope an inclination towards each other, so that the plunger, which now begins again to descend, comes down over the flaps, which are now on the inside of it, and laid into their proper relative positions; that is to say, the gum-leaf of the envelope is laid down first, owing to the projection on that side of the plunger being the longest, and first coming in contact with the envelope, after which the two ends are brought down upon the gum-flap. The plunger is then again raised out of the box G, and the trap O is caused to fall by the lever O^1, being acted upon by the rod O^3 and cam O^4, which allows the envelope to slide down upon the endless band in the trough or spout P, which endless band being in motion by the cord P^2 from the pulley P^3 on the shaft D, carries with it the envelope beneath the set of rollers Q^1, Q^2, Q^3, Q^4, Q^5, which press the flaps well down upon each other, and firmly secure the end flaps upon the gum-flap, delivering the envelope complete into any receiver that may be placed for its reception. The trap O is then restored to its horizontal position, and the process repeated.

ON THE PROBABLE INFLUENCE OF THE ROTATION OF THE EARTH ON LOCOMOTION BY SEA AND BY LAND.

Sir,—The difference of time required for the homeward passage, as compared with the outward voyage to America, has long been known as a fact, but insufficiently explained. The popular solution of the difficulty has been, that it is up-hill one way, and down-hill the other; this explanation, however, is too unphilosophical to be received by scientific men, and some have attributed it to the prevalence of currents in one direction, while a much more probable cause appears to have been overlooked altogether; viz., the *rotation of the earth on its axis*. The earth being nearly globular in its form, it is evident that every parallel of latitude on its surface will move with a different degree of rotative velocity in either hemisphere; and the rotative velocity at the equator being more than a thousand miles per hour, and diminishing (by a ratio it is not necessary to enter into here) to nothing at the pole; it is certain that a body *suddenly* changing its location for some place nearer to the pole, would have an excess of rotative velocity; and in the case of a ship at sea so changing its place, such velocity would become motive power, which the helmsman might direct. Nor would this excess of rotative motion be the less real in its efforts because the ship had *gradually* changed its position.

If we take a converse view of the case, then the inertia of the vessel will have to be overcome in the contrary way; being deficient in rotative velocity as it progresses towards a more southern latitude, the outward-bound ship will tend to fall westward of its course, which tendency will have to be counteracted by an expenditure of some degree of sailing power. The remarks here made in reference to locomotion at sea, will, under certain limitations, apply to locomotion by land; and had there been a *level* line of railway running north and south, it is very likely that the effect of the earth's rotation would have been noticed before now in its *accelerating* or *retarding* influence, according to the direction travelled in.

If the gradients, combined with other circumstances, render the possible velocity attainable by a given expenditure of power in each direction on any line a difficult point to ascertain, it is possible that a careful inspection of the metals or lines bearing north and south would show that a greater amount of lateral pressure and friction has been sustained

by the off-rails, as well as by the off-wheels of the engines on those lines. It must not, however, be supposed that the whole effect will appear, as the coming of the wheels will counteract the side thrust against the rails, so as to produce an oscillating motion, which will go far towards equalizing the wear on both rails. Some rather important conclusions in relation to railway travelling arise out of the view now taken. The difference between the rotative velocity of the earth in surface motion at London and at Liverpool is about twenty-eight miles per hour; and this amount of lateral movement has to be *gained* or *lost*, as respects the locomotive in each journey, according to the direction we are travelling in from the one place to the other; and in proportion to the speed will be the pressure against the side of the rails, which, at a high velocity, will give the engine a tendency to climb the right-hand rail in each direction. Could the journey be performed in two hours between London and Liverpool, this lateral movement or rotative velocity of the locomotive would have to be *increased* or *diminished* at the rate of nearly one-quarter of a mile per minute, and that entirely by side pressure on the rail, which, if not sufficient to cause the engine to leave the line, would be quite sufficient to produce violent and dangerous oscillation. It may be observed, in conclusion, that as the cause above alluded to will be inoperative while we travel along the parallels of latitude, it clearly follows that a higher degree of speed may be attained with safety on a railway running east and west than on one which runs north and south.

I am, Sir, yours, &c.,

URIAH CLARKE.

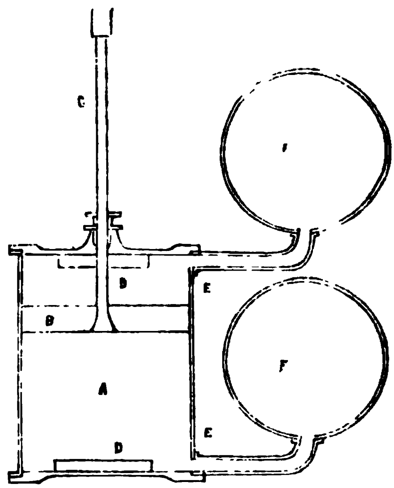
Leicester, June 9, 1852.

WATER PRESSURE ENGINES.

Sir,—Perhaps one of the chief obstacles to the use of water-pressure engines, is the great concussion caused by the water at the beginning and end of the stroke. I beg, therefore, to call your attention to a means by which I think this obstacle may be removed, trusting that it will find a place in your valuable Magazine, if it has not been already suggested or adopted.

I propose to apply to the water-engine the means in general use for keeping up a constant stream of water in fire-engines. Air being perfectly elastic, it is reasonable to suppose that the required degree of elasticity necessary to prevent the concussion, may be obtained by using the air in connection with the water.

In the following sketch, the water is to be cut off at the three-quarter stroke, and the air which is compressed by the pressure of the water, when it first enters the cylinder, re-acts upon the water as soon as it is cut off, and thus accomplishes the remainder of the stroke without concussion.



A is the cylinder, B the piston, C the piston-rod, DD the ports, EE two pipes joining the cylinders FF with the cylinder A.

The cylinder, valves, &c., are the same as those of the steam-engine, and are worked in the same manner. The only novelties are the cylinders FF and their pipes, which cylinders contain air.

The manner of working with the proposed application of air, is as follows:—The water enters one of the ports, say the upper, and exerts part of its force on the piston, and part to compress the air in the upper cylinder F. After the air is compressed into its smallest volume, the water exerts its full force on the piston, and so continues until it has made three-quarters of the stroke. By part of the pressure of the water being expended in compressing the air, the water enters

the cylinder A, and acts on the piston without concussion. When the piston has made three-quarters of its stroke, the water is cut off, and the expansion of the air in the cylinder F re-acting on the water, accomplishes the remainder of the stroke, which is thus ended without concussion.

The cylinders FF ought to be equal to half the contents of the cylinder A, if the water is cut off at three-quarters stroke.

Any injurious effects resulting from the momentum the water has received during the time it flows into the cylinder, by its suddenly being cut off, might be prevented by having a sphere or cylinder, containing air in communication with the supply pipe, a little in advance of the valves, like those attached to the working cylinder A. By this means the momentum of the water will expend itself on the air by compressing it into a smaller volume. After the momentum is expended, the air will recover its former bulk.

In many establishments, great quantities of water coming from a reservoir at an elevation, or by other means, having a pressure upon it, escapes from the taps, &c., without its pressure ever being employed, while there is perhaps steam, or some other costly motive power employed, to do the work which the water under pressure would do gratis, if it were properly applied. I am, Sir, &c.,

D. E. F.

June 25, 1852.

EXPERIMENTS WITH ANCHORS.

(Continued from p. 34.)

Fourth Day's Trial.—Monday, July 5.

1. The trials were resumed this day at 10 A.M., when Mr. Aylen's anchor was placed in competition with the new Admiralty anchor. At a long scope of cable, each dragged 5 feet 10½ inches. At short stay the Admiralty anchor was tripped out of the ground at a total distance of 14 feet 4½ inches from the first position, Aylen's holding on firmly, without having moved in the least degree from its position at long range.

2. Mitcheson and Son's anchor was then tested with Aylen's. The distance dragged at long scope by Mitcheson's was 4 feet 2½ inches; by Aylen's, 8 feet 4½ inches. At short stay Aylen's was lifted out of the ground at a total distance of 19 feet 7 inches, from first position, Mitcheson's holding on at 8 feet 4½ inches total.

3. The next trial was between Rodgers's Exhibition prize anchor, and the new Admiralty anchor. Rodgers's at long range of cable gave way 8 feet 5 inches; the Admiralty, 10 feet. At short range the Admiralty's tripped out of the ground at a total distance of 25 feet 1½ inch, Rodgers's holding on at 13 feet 8½ inches; showing the great superiority of holding power of the latter.

4. The experiments of this day terminated with the trial of Rodgers's Exhibition prize anchor, with Aylen's. Rodgers's drew 7 feet 2½ inches; Aylen's, 7 feet 5½ inches, at long range of cable. At short stay, Rodgers's held on at a total distance of 10 feet 3½ inches, lifting Aylen's out of the ground at 21 feet 9 inches from the first position.

Fifth Day's Trial.—Tuesday.

The experiments were commenced to-day by Isaacs's American anchor being tried against Mr. J. Aylen's. At long scope the former drew 8 feet 7 inches; Aylen's 2 feet 5 inches. At short stay the American anchor was tripped out of the ground at a total distance from the first position of 18 feet 3 inches, Aylen's having dragged only 10 inches from its position at long range.

At the request of Mr. Trotman, his anchor of 25 cwt. 0 qr. 6 lbs. was tested against one of the new Admiralty anchors, weighing 40 cwt. 3 qrs. 7 lbs. On first trial at long scope of cable, Trotman's dragged 7 feet 5 inches; the Admiralty anchor 6 feet 1 inch. On second trial at short stay Trotman's was tripped out of the ground at 25 feet total distance from first position, the Admiralty anchor dragging 8 inches, or a total of 6 feet 9 inches from first position. In consequence of the very great difference of weight in this last trial, amounting to 75 per cent. in favour of the Admiralty anchor, the Committee suggested that Trotman's anchor should be tried against an Admiralty anchor of 35 cwt. 2 qrs. In this case, at first trial on a long scope of cable, Trotman's was dragged by the Admiralty anchor 6 feet 8 inches, the latter dragging 6 feet 7½ inches. On the second trial, at short stay, Trotman's anchor was tripped out of the ground at 26 feet total distance from first position, holding firmly to the last foot of ground. The total distance dragged by the Admiralty anchor was 10 feet 11½ inches, being a distance of 4 feet 4 inches; the Admiralty was drawn during the second experiment. With this terminated the trial of anchors on dry land. On Friday, the 16th inst., the second series of trials will commence, on the beach at the back of the garrison.

Analysis of the Results of the first series of Experiments on Anchors:

Trial.	Names of Owners.	Weight.			Distance at Long Scope.		Distance at Short Stay.		Total.		Results.
No.		C.	q.	lb.	ft.	in.	ft.	in.	ft.	in.	
1	Honibal's........	24	3	20	1	6	0	2½	1	8½	Holding on.
	v.										
	Aylen's	24	2	24	3	7½	9	7	13	2½	Lifted out of the ground.
2	Mitcheson's......	25	0	8	1	6	0	2¼	1	3¾	Holding on.
	v.										
	Isaacs's	25	0	17	5	7	5	11	11	6	Lifted out of the ground.
3	Trotman's	25	0	6	3	7¼	0	2¼	3	9½	Holding on.
	v.										
	Rodgers's........	24	2	22	5	0	13	0	18	0	Lifted out of the ground.
4	Lennox's........	24	1	25	2	7½	15	3½	17	11	Lifted out of the ground.
	v.										
	Admiralty, new ..	25	0	0	1	6¼	9	2	10	8¼	Holding on.
5	Honibal's........	24	3	20	4	4½	2	4	6	8½	Holding on.
	v.										
	Mitcheson's......	25	0	8	5	6	18	10½	24	4½	Lifted out of the ground.
6	Admiralty, new ..	25	0	0	6	8	16	2	22	10	Lifted out of the ground.
	v.										
	Trotman's	25	0	6	4	10½	5	0½	9	11	Holding on.
7	Honibal's........	24	3	20	5	0	11	6	16	6	Lifted out of the ground.
	v.										
	Trotman's	25	0	6	6	5	3	9	10	2	Holding on.
8	Rodgers's........	23	2	22	7	8½	16	9½	24	6	Lifted out of the ground.
	v.										
	Trotman's	25			6	0	3	1	9	1	Holding on.
9	Mitcheson's......	25	0	8	1	6½	..		1	6½	Holding on.
	v.										
	Admiralty, new ...	25	0	0	8	7	6	2½	14	9½	Lifted out of the ground.
10	Trotman's	25	0	6	6	0	0	1	6	1	Holding on.
	v.										
	Admiralty, new ..	30	0	7	3	10	15	5	19	3	Lifted out of the ground.
11	Mitcheson's	25	0	8	6	4½	0	4½	6	9	Holding on.
	v.										
	Rodgers's (Stream Kedge)	25	0	14	7	7	16	5	24	0	Lifted out of the ground.
12	Mitcheson's......	25	0	8	4	0	2	0	6	0	Holding on.
	v.										
	G. W. Lennox's..	24	1	25	7	11	14	5½	22	4½	Lifted out of the ground.
13	Aylen's	24	2	24	5	10½	..		5	10½	Holding on.
	v.										
	Admiralty, new ...	25	0	0	5	10½	8	6	14	4½	Lifted out of the ground.
14	Mitcheson's......	25	0	8	4	2½	4	2	8	4½	Holding on.
	v.										
	Aylen's..........	24	2	24	8	4½	11	2½	19	7	Lifted out of the ground.
15	Rodgers's (Exhibition prize)..	24	2	22	8	5	5	3½	13	8½	Holding on.
	v.										
	Admiralty, new ..	25	0	0	10	0	15	1½	25	1½	Lifted out of the ground.
16	Rodgers's (Exhibition prize) ..	24	2	22	7	2½	3	1	10	3½	Holding on.
	v.										
	Aylen's	24	2	24	7	5½	14	3½	21	9	Lifted out of the ground.
17	Isaacs's	25	0	17	8	7	9	8	18	3	Lifted out of the ground.
	v.										
	Aylen's..........	24	2	24	2	5	0	10	3	3	Holding on.
18	Trotman's	25	0	6	7	5	17	7	25	0	Lifted out of the ground.
	v.										
	Admiralty, new ..	40	3	7	6	1	0	8	6	9	Holding on.
19	Trotman's	25	0	6	6	8	19	4	26	0	Lifted out of the ground.
	v.										
	Admiralty, new ...	35	2	0	6	7½	4	4	10	11½	Holding on.

Judging from the results attained by the preceding experiments, it would appear that Trotman's improved Porter's anchor possesses fully 25 per cent. more holding properties on dry land than any other with which it has been tried. Mr. Trotman feels confident that similar results will attend the subsequent trials on the beach and at sea. Should such be the case, the labours of the Committee will be repaid in the feeling of satisfaction of having rendered to the maritime interest of this country, and to humanity generally, a great boon in an improved and truly efficient anchor, formed purely on scientific principles worthy of the age in which we live. It is impossible to overrate the importance of these experiments (the first series of which have been brought to a close), their tendency being the preservation of life and property. —*Times.*

ON THE MANUFACTURE OF HYDROCARBON COAL-GAS FROM BOGHEAD COAL. BY ANDREW FYFE, ESQ., M.D., F.R.S.E.

In a paper published in the *Journal of Gas Lighting* for July, 1850,* I drew the attention of the public to the quality of resin and water gas, and then stated that the gas thus produced had not the high alue that was ascribed to it by those who had introduced it, and that, consequently, its introduction as a source of light ought to be abandoned. That I was correct in my conclusions has been proved by the process having been given up by its most strenuous supporters, and by the patentee himself. Since that time, attention has been drawn to the influence of water over coal gas, and marvellous accounts have been made public of the enormous saving that is to be effected by the introduction of what is now styled "hydrocarbon gas from coal."

In my report on Boghead cannel coal, published in November, 1850, after stating the remarkable qualities of that coal for the purpose of illumination, I concluded by observing:

"It is valuable, not only on account of the large quantity of gas which it affords, and for the high illuminating power of that gas, as indicated by the photometer—it will be found also to be extremely valuable, from the large quantity of matter condensible by chlorine which it contains, and which is the principal source of light. Accordingly were Boghead coal gas mixed with gas from inferior kinds of Parrot coal, and from English caking coal, it would add greatly to their illuminating power; or, which is the same thing, were Boghead gas *diluted* with gas from these inferior coals, while the quantity of gas would be increased, the illuminating power of the Boghead coal gas, as indicated by the photometer, would, most probably, be very little diminished. I conceive, therefore, that the Boghead coal will be of great use to those using inferior kinds of coal in the manufacture of gas, such as the poorer Scotch cannel coals, and especially the English caking coal."

At the time that I made the above remarks, I had in my mind gas, not only from *inferior kinds of coal*, but also from water, by the hydrocarbonizing process, with the view merely of *diluting* the rich Boghead gas, and of enabling us to consume it advantageously; as I conceive that, by the methods in use for burning gas, those rich in matter condensible by chlorine are not so consumed as to make them give the light that they ought to yield, were they properly burned. Since the publication of that report, I have been anxious to put these opinions to the test of experiment; circumstances, however, have prevented me from doing so till within the last few weeks. Having lately had the opportunity of thoroughly investigating the subject, I shall now proceed to enumerate the results. These trials, I may state, were undertaken solely with the view of ascertaining whether the use of water would in any way prove beneficial in the manufacture of coal gas for illuminating purposes; and as I thought that Boghead coal, from its great quantity of volatile matter, and from the high per centage of matter condensible by chlorine in its gas, would be most likely to prove the truth or fallacy of these opinions, I have confined my trials entirely to it.

In considering the hydrocarbon process, as it is now generally styled, two important questions occur:

1. Is there any increase in the *amount of light* obtained from a given weight of coal?

2. Is there any economy in using the water and cannel-coal gas, instead of that from Boghead alone?

In the experiments, the results of which I am now to give, the Boghead coal that was used was that with which the gas works at Aberdeen have lately been supplied for the manufacture of their gas.

In my printed report on the value of Boghead cannel, I gave the results of my trials on that which was at that time sent to the works, as yielding 14,800 feet of gas per ton; having 27 per cent. of matter condensible by chlorine, one foot of which gave

* Republished in *Mech. Mag.*, vol. liii., p. 92.

the light of 7·72 sperm candles burning 140 grains per hour—that is, 9·4 candles of 120 grains: thus making 1 foot give the light of 1080·8 grains of sperm; the gas per ton of coal was, consequently, equal to 2283·2 lbs. of sperm.

To secure accuracy in the trials with water, the quality of the Boghead coal to be used was first ascertained. For this purpose a quantity of it was broken to pieces, and set aside for the experiments, both on the coal alone, and for the water process. Six trials were made at different times, in the usual way, excepting that the heat was higher than in the trials formerly reported on. Seven pounds of coal were used in all the trials. The following are the results. The durability is that of a cubic foot burnt through a jet one thirty-third of an inch in diameter, and 5-inch flame. The candle is one burning 120 grains per hour:

The average of these trials gives one foot of gas, equal to 11·79 candles of 120 grains, and the gas from a ton of coal equal to 3253·5 lbs. of sperm: a much higher quantity than I got before; but it must be kept in recollection that it was this cargo of coal on which the water trials were made.

Cubic feet per ton.	Specific gravity.	Condensation by chlorine.	Durability.	Argand 58 holes consuming ft. per hr.	Illuminating power 1 ft. = candles	1 foot = grs. sperm.	Gas of 1 ton = lb. sperm.
			m. s.				
15,866	595	23·75	75 50	4·	10·57	1260·	2856·
15,413	738	26· 0	85 50	5· 5	11·62	1399·2	3082·
17,680	698	23· 0	83 20	3· 6	12·12	1454·6	3674·
16,320	652	20· 0	80 0	3·77	11·93	1431·6	3337·6
15,866	687	20· 0	79 20	4·	11·96	1435·5	3255·
15,413	689	21· 5	82 0	3·87	12·55	1506·	3315·9
16,093	650	19·75	81 3	4·12	11·79	1414·5	3253·5

In conducting the trials with the Boghead and water together, I had recourse to an apparatus similar to that erected by Mr. White at Grand Holm, in the neighbourhood of Aberdeen, and to those used at Manchester and other places. It consisted of two iron retorts; one for the generation of water gas, the other for the coal gas. Each retort was 2 feet 6 inches long, ⌓ shaped, and 9 inches wide. In each there was a diaphragm, passing from the mouth to within 3 inches of the other extremity, dividing it into an upper and under compartment, shut off from each other, excepting at the back end. Both compartments of the water retort were filled with charcoal, and a tube from a tank conveyed water into its upper compartment, by which the water was made to pass first through the charcoal in it, and then in the lower one, from which the gas generated, along with surplus steam not decomposed, passed through the coals into the lower, and then into the upper compartment of the coal retort. From this it proceeded to the hydraulic main, the condenser, and purifier, to the gasholder, in the usual way. In all the trials two gasholders were used; these were exactly of the same dimensions, were nicely equipoised, and accurately graduated. The whole of the gas thrown off was propelled into them uniformly in the same ratio during the whole of the performance of the experiment, as was proved by their rising in the same ratio; but, to secure accuracy, the gas in each was tested, and found to be of the same composition. In manufacturing the gas, sometimes the usual heat, sometimes a higher, occasionally a lower heat, was resorted to. In ascertaining the illuminating power by the Bunsen photometer, a sperm candle, burning 140 grains per hour, was always employed, and then proportioned to one consuming 120 grains, so as to enable me to compare the results with those of other experimenters. The gas was burned by a 58-hole Winfield Argand; and different trials were made with each gas, to find out the most profitable consumpt. It is unnecessary for me to record all the trials; I leave out those made at first with the view of finding out the proper mode of proceeding, as I found that the process is a very uncertain one, the results varying very much, even when it seems to be conducted under similar circumstances.

The following is a Tabular view of the results of the eight best trials;

Cubic feet of gas per ton of coal.	Specific gravity of gas.	Condensation by chlorine.	Durability jet $\frac{1}{32}$, 5-inch flame.	Argand having 58 holes consuming feet per hour.	Illuminating power per foot = cand. 120 grs.	1 foot = grs. sperm.	Gas per ton = lb. sperm.
39,893	434	8· 5	35′ 45″	8·0	4·61	553·2	3152·6
39 893	453	9·33	40 50	8·0	5·25	630·	3590·
39,893	536	11· 0	43 0	9·0	5·13	615·6	3508·
38,986	646	12· 0	46 40	7·2	5·46	655·2	3649·
38,986	666	11· 0	44 10	7·2	4·08	489·6	2726·5
39,893	663	12·75	46 0	7·2	4·85	582·	3316·8
39,896	600	11·33	46 30	7·5	5·02	601·2	3426·5
38,986	606	11·25	42 40	8·3	3· 5	420·	2339·
39,553	575	11·44	43 20	7·8	4·73	568·5	3213·5

In the two first and the two last of these trials, the production of gas was continued till the desired quantity was obtained. In the others, it was carried on during the same, or nearly the same length of time, that by previous trials was found to be necessary for carbonising the same quantity of coal alone. In these instances, the water was more rapidly propelled through the retorts than in the others, especially towards the commencement of the process.

These trials show that the process is very uncertain in its results, even when it is conducted under similar circumstances. The average of all the above-mentioned trials is, that from a ton of Boghead coal by the water process, there are obtained in this way 39,553 feet of gas, each foot of which gives the light of 4·73 candles, burning 120 grs. per hour; that is, 561·5 grs. of sperm, making the gas from a ton of coal give the light of 3213·5 lbs. of sperm.

These results may be considered as what the hydrocarbon process will yield; indeed, they nearly correspond with those given by Dr. Frankland and Mr. Clegg; for, though the quantity of gas is inferior, yet the illuminating power of each foot is superior, and thus the pounds of sperm per ton of coal are nearly the same.

Dr. Frankland, in his Report (*Journal of Gas-Lighting*, January, 1852), states that from Boghead cannel he obtained 13,240 feet of gas per ton, the illuminating power of which per foot was 10·52 candles of 120 grs.; consequently each foot was equal to 1262·4 grs., and the gas of the ton was equal to 2387·7 lbs. of sperm. In my trials the average was 3213·5 lbs. per ton; therefore, 34 per cent. beyond his. From Boghead and water Dr. Frankland got 51,720 feet per ton, the illuminating power of which was equal to four candles per foot; and the total quantity was, therefore, equal to 3546·5 lbs. The average of my trials was 3213·54 lbs.

Mr. Clegg, in his Report published after most of the foregoing trials were made, has given very nearly the same results. He obtained 52,000 feet of gas from a ton of Boghead coal by the action of water, each foot of which was equal to four candles—that is, to 480 grs. sperm; the total quantity was, therefore, equal to 3515·7 lbs. We may therefore consider the results of my trials as correct; and thus confirming to a certain extent, those of Dr. Frankland and Mr. Clegg; viz., that from a ton of Boghead coal, by the action of water, a quantity of gas can be obtained which, when properly consumed, will give the light of about from 3,200 lbs. to 3,400 lbs. of sperm. They differ, however, from them in two very important points; my gas, by the water process, though giving about the same light, was not nearly so great in quantity; it was about 24 per cent. less. Again; in Dr. Frankland's trials, the quantity of gas from Boghead coal amounted only to 13,240, and the pound of sperme to 2387·7 per ton of coal. The increase in quantity of light, by the water process, was therefore 47 per cent. In my trials, though the amount of sperm per ton was in some a little more, yet *the average of all the trials gave a little less by the water process than by Boghead alone.* I think that this may be satisfactorily accounted for by the low results obtained by Dr. Frankland from the Boghead coal. I have never had a smaller quantity than 14,200 feet per ton, with one exception, in which case it was only 13,370 feet. Of twelve trials, the quantity varied from 14,200 to 17,680 feet. This may be owing to the low heat at which the gas was driven off by Dr. Frankland, and which he states

is the best, both for the coals alone and for the production of gas by the water process. On the contrary, I have found the best results are got from Boghead coal by using a heat higher than usual. The best result I ever had was that in which the heat was *very high*. In that case I got 17,680 feet; and, what is remarkable, the illuminating power of the gas was also higher; it was equal per foot to 12·12 candles of 120 grs.; that is, equal to 2,676 lbs. of sperm per ton of coal—a quantity *beyond that got by Dr. Frankland by the water process.*

The above remarks apply solely to trials with Boghead coal, so as to obtain from it a large quantity of gas, the illuminating power of which will be about 4 or 4·5 candles per foot; and, in my opinion, they are sufficient to warrant the conclusion, that though there is an increase in the quantity of gas per ton of coal by the water process, which no one ever doubted, yet that *there is no increase in light from the gas of a ton of coal compared with that obtained in those instances in which the carbonising of the coal alone is properly conducted.*

Admitting the accuracy of the conclusion to which I have come, and which, in my opinion, the results of my trials warrant, I have next to consider whether there may not be a gain by obtaining a much larger quantity of gas, even though it is of inferior illuminating power.

The results of the trials which I am now to give, were conducted on a smaller quantity of coal, in the same apparatus. The heat of the water retort was kept high, to enable me to pass through it the requisite quantity of water, which, as has *been recommended*, was propelled as rapidly as could be done, towards the commencement of the process. The following are the results of five trials:—

Cubic feet gas per ton of coal.	Specific gravity of gas.	Condensation by chlorine.	Durability jet $\frac{1}{35}$, flame 5-inch.	Argand feet per hour.	Illuminating power per foot, = candle 120 grs.	1 foot = grs. sperm.	Gas per ton = lb. sperm.
			m. s.				
52,133	466	5·75	35 20	8·	2· 1	252·	1876· 8
52,359	466	6· 5	35 30	9·	1·91	229·6	1717· 4
52,352	460	6· 0	33 50	9·	2·06	240·8	1801·14
51,680	460	5·25	35 0	9·	2·11	253·4	1870·96
51,680	460	5· 5	34 10	9·	1·81	217·	1602·
52,042	462	5· 8	34 40	8·8	1·99	238·56	1773·6

These trials prove satisfactorily that there is, by this mode of operating, not only no gain, but actually a loss of light *to a very great extent*. From a ton of Boghead coal alone I got gas, the light of which was equal to 3253·5 lbs. of sperm. By this process, though the quantity of gas was great, yet the light of that gas per ton did not exceed 1773·6 lbs. of sperm, showing a loss of 1479·8 lbs. of sperm on the whole quantity—that is, 46 per cent.

Dr. Frankland states that he got 51,720 feet of 4-candle gas from a ton of coal, by the hydrocarbon process; making the lb. of sperm per ton equal to 3546·5. The gas of a ton of Boghead alone was in his experiments equal to 2387·7 lbs. of sperm, there being, therefore, according to him, an increase in the amount of light of 1158·8 lbs. of sperm—that is, of 48 per cent. In my trials, instead of an increase, there was a loss of 1772·3 lbs. of sperm on the whole quantity—that is, of 46 per cent.

How are we to reconcile these discordant results? I have already stated that, while Dr. Frankland got gas from Boghead alone equal to 2387·7 lbs. of sperm, I got gas equal to 3253·4 lbs. But Dr. Frankland's gas, when 51,720 feet per ton were obtained, was equal to 3546·5 lb. of sperm; which, though an increase of 48 per cent. on the Boghead gas by his own trials, is only 9 per cent. over the Boghead gas by mine. Why I have always had a loss instead of a gain, I cannot conceive. The only difference in the modes we have followed, in ascertaining the quality of the gases which we produced, is, that he received into his gasholder only a *part* of the gas as it was evolved from the coal, and of which gas only he tried the illuminating power; while I received the *whole* of the gas into my gasholders, and tested it. Surely my method is the more correct of the two, and claims more confidence in its results. Be this as it may, I conclude from these trials that, by the fur-

ther use of water, no benefit is derived; indeed, that while the use of a small quantity of water does little harm in diminishing the amount of light, the use of a large quantity of water, with the view of procuring a large quantity of gas, proves injurious to a considerable extent. In further proof of this I give only one trial. In it the illuminating power per ton of coal was reduced in a very great degree.

Gas per ton.	Specific gravity.	Condensation by chlorine.	Durability.	Argand feet per hour.	Illuminating power 1 foot = cand.	1 foot = grs. sperm.	Gas per ton = lb. sperm.
75,253	640	4·125	m. s. 29 10	9	0·27	32·4	348·3

According to Mr. Clegg, 75,000 feet of gas, of 2·4 candles per foot, were got from a ton of Boghead—that is, equal to 2880 lbs. of sperm per ton. I could only get 345·5 lbs. How to reconcile these very discordant results I know not. I wish much that Mr. Clegg had stated the details of the process by which he succeeded in procuring this large quantity of gas, and how he ascertained the illuminating power. That there must be a great loss in all attempts to obtain a large quantity of gas from Boghead is evident. It is well known that, when this coal is carbonised at a low heat, it yields either a comparatively small quantity of gas, or, if the gas be in larger quantity, it is of low illuminating power. In trials with water, in which, with the view of obtaining a large quantity of gas, the water is propelled through the retort rapidly, to produce, as it is supposed, the full beneficial effect, the heat must be brought very low. Hence, probably, the cause of the loss in the illuminating power when we attempt to increase the quantity of gas.

Though, by the use of water to get a large quantity of gas from Boghead coal, there is no increase in the amount of light from the gas of a ton of coal, yet there may be some beneficial influence exerted when the water is used, as to yield a much smaller quantity of gas. One trial was made in this way, and the following is the result:

Gas per ton.	Specific gravity.	Condensation by chlorine.	Durability.	Argand feet per hour.	Illuminating power 1 foot = cand. 120 grs.	1 foot = grs. sperm.	Gas of 1 ton = lb. sperm.
24,932	554	11·75	m. s. 48 20	6·8	6·51.	781·2	2782·4

In this case, though the increase of gas amounted to 54 per cent., yet there was a loss of light in that obtained from Boghead alone to the extent of about 15 per cent.; still further proving that water not only does not exert any beneficial influence, but that, in most cases, it actually proves injurious, by reducing the total amount of light got from the coal in the usual way of carbonising it.

The remark made regarding the uncertainty of the process is also still further proved by the above trial. It seems difficult so to regulate it as to obtain always the same results.

From what has now been said, I think I am still further warranted in coming to the general conclusion that, *in no instance is there any gain in the amount of light from Boghead coal gas by the agency of water in the method recommended by the advocates of the "hydrocarbon gas,"* and that, in those cases in which the quantity of gas is increased to a great extent, there is a decided loss by the agency of the water.

I come now to consider the question of economy. Assuming that my experiments prove that there is no gain in the amount of light by the combustion of the gas from a ton of Boghead coal by the water process,

a question here arises, may not the large quantity of hydrocarbon gas be manufactured at a less expense than the gas from the coal alone? That it may be so per 1000 feet we can easily imagine; but this is not the question to be solved. Gas, like other articles, ought to be paid for according to its value. The more light that 1000 feet will yield when properly consumed, the more ought to be paid for it; of course the consumer ought to keep this in view, viz., the lower the quality of the gas that he burns, the less ought he to pay for it. I fear that this has not been attended to by those who have so strongly advocated the manufacture of a larger quantity of gas from coal by the addition of other substances, such as in the "hydrocarbon" process. I enter upon this part of the subject with diffidence, because I have no satisfactory trials of my own on the results of which I can found calculations. In the trials which I have above recorded, I found that 2 lbs. of charcoal were consumed in the water retort, when 7 lbs. of coal were carbonised in the other; and that, to bring out the best results, the quantity of water to be passed through the water retort required to be nearly equal in weight to the coal to be carbonised in the other. Accordingly, for each ton of coal used, it would be necessary to evaporate about a ton of water, and to consume about a quarter of a ton of charcoal, or rather of coke, to produce the requisite quantity of water gas. These would, to a certain extent, show the additional quantity of fuel necessary in the hydrocarbon process. Fortunately, however, there is no necessity for having recourse to calculations founded on these data, and to which, no doubt, objections would be raised. We have statements given of the expense of manufacturing water gas; and, though there is a wide difference between them, I shall take those given by Mr. Clegg in his report, not because I consider them correct, for I think he states the expenditure by far too low, but because they are given by one who advocates strongly the hydrocarbon process, and whose report has been extensively circulated by those who have an interest in it. Surely they will not find fault with me for adopting these statements?

In Mr. Clegg's report it is stated that 1000 feet of Boghead coal cost in the manufacture, including coals at 28s. per ton, labour, lime, fuel, repairs on retorts, &c., 2s. 11½d.—that is, 35d·5. According to Mr. Clegg, water gas, manufactured by the passage of steam over coke, cost 5d. per 1000 feet; and 1000 feet of hydrocarbon gas from Boghead coal, at 28s. per ton, will cost, including the same items. 1s. 0¾d.—that is, 12d·75; 13,500 feet being got from the ton of Boghead when carbonised alone; 52,000 feet from the ton by the water process. The comparative expense, then, of the manufacture of gas per 1000 feet, is as 35·5 to 12·75, or very nearly 3 to 1, when the quantity of hydrocarbon gas stated is got from the ton of coal. Of course the price per 1000 feet will vary according to the quantity obtained, 5d. per 1000 feet being taken as the price of the pure water gas itself. Were the gases of equal illuminating power, then there would be a very great saving; but, in ascertaining the value of a process of this kind, the value of the gas, not only bulk for bulk, but of the total quantity per ton of coal, must likewise be taken into account. The results of my trials show that each foot of the Boghead gas gives the light of 11·79 candles, consuming 120 grains per hour, while a foot of the Boghead and water gas gives that of only 4·73 candles; consequently, to get the same light from both, for every 1000 ft. of the Boghead gas used, we must consume 2490 ft. of the hydrocarbon gas, and must pay accordingly for it. The consumer ought to be aware of that, and, consequently, he ought to get his hydrocarbon gas, per 1000 feet, for less than half the price that he pays for the Boghead; otherwise he is a loser by using it instead of the Boghead, or another gas of the same illuminating power as the Boghead. But, again; the important question here occurs, can the manufacturer afford to dispose of his hydrocarbon gas at this lower rate? If the statements that have from time to time been published regarding the hydrocarbon gas be correct, then he ought to do so; but, on further investigation, I fear we must come to a very different conclusion.

Assuming the accuracy of the results of my trials with Boghead, and with Boghead and water together, let us see how the matter stands; and what I have now to say, applies not only to my own experiments, but likewise to those of Dr. Frankland and Mr. Clegg. The average result of my six trials on Boghead coal yielded 16,093 feet of gas per ton. Take the coal at 28s. per ton, then

Cost of Coal	28s., or 336d.,	or 20d·87 per	1000 ft.
Manufacture according to Clegg ..	143d·775,	or 8d·934	ditto.
Total charge per ton	479d·775,	or 29d.804	ditto.

This gas gave the light of 11·79 candles per foot—that is, 3253·5 lb. sperm per ton; 1000 feet, therefore, equal to 11,790 candles, cost 29d·8.

The average of my eight trials with Boghead and water gave 39,553 feet per ton of coal; then, as before,

Coal and manufacture........	16,093 feet,	479d·775
Water gas, according to Clegg..	23,460 ,, at 5d.	117d·3
Total coal and water gas, cost............		597d 075, or 15·d09 per 1000.

The gas gave the light of 4·73 candles per foot—that is, 3213·5lb. sperm per ton; 1000 feet, therefore, equal to 4·730 candles, cost 15d·09.

Then,

lb. sperm per ton, Boghead.	lb. sperm per ton, Boghead and water.	Cost of coal gas per ton.	Comp. cost of coal gas.

3253·5 : 3213·5 : : 479·77 : 473·87 ; and 597· : 473·87 : : 100 : 79·3.

Saving in favour of Boghead gas alone = 20·7 per cent. Again;

3213·5 : 3253·5 : : 597 : 604·4 ; and 604·4 : 479·77 : : 100 : 79·3

Saving in favour of Boghead gas alone = 20·7 per cent.

The same results are got by another process. The Boghead gas for 11,790 candles cost 29d·8. The Boghead and water gas for 47,300 cost 15d·09.

Candles per 1000 feet coal gas.	Candles per 1000 feet coal and water-gas.	Cost of coal gas.	Comp. value of coal and water gas per 1000 feet.

11,790 : 4730 : : 29·8 : 11·95; and 15·09 : 11·95 : : 100 : 79·1

Saving in favour of Boghead gas alone = 20·9 per cent.

Candles of water gas.	Candles of coal gas.	Cost of coal gas.	Comp. value of coal gas.

4730 : 11,790 : : 1509 : 37·6; and 29·8 : 37·6 : : 100 : : 79·2

Saving in favour of Boghead gas alone = 20·8 per cent.

In these calculations the results do not exactly correspond, because I have not thought it necessary to extend the fractions. They are sufficient to show, that according to the results of my trials, in which the quantity of hydrocarbon gas per ton of coal was 39,553 feet of 4·73 candle gas per foot, there is an actual loss by the use of water in the hydrocarbon process to the extent of about 20 per cent.; and this loss is incurred in the manufacture of the gas, independent of other items.

I have next to advert to those instances in which the quantity of hydrocarbon gas per ton of Boghead was greater. When 52,042 feet of gas were obtained, the illuminating power per foot was on an average only 1·99 candles—that is, 238·56 grs. of sperm per foot, and 1773·6 lbs. per ton of coal.

Then, as before:

1 ton coal, yielding	16,093 ft.,	total cost	479d·775
Water gas ..	35,950 ft.	do.	179d·752, or 5d. per 1000 feet.
	52,042	do.	659d·527, or 12d·672 per 1000 ft.

One foot of gas was equal to 1·99 candles—that is, 1773·6 lbs. of sperm per ton of coal. Total cost, 659d·527.

One foot of Boghead coal gas, as before, equal light of 11·79 candles—that is, 3253·5 lbs. sperm per ton. Cost, 479d·77. Then

Coal gas = lb. sperm per ton.	Coal and water gas = lb. sperm per ton.	Cost of coal gas.	Comp. value of coal and water gas.

3253·5 : 1773·6 : : 479·77 : 261·5; and 659 : 261·5 : : 100 : 39·6

Saving in favour of Boghead gas only = 60·4 per cent.

Coal and water gas = lb. sperm per ton.	Coal gas = lb. sperm per ton.	Cost of coal and water gas.	Comp. value of coal gas.

1773·6 : 3253·5 : : 659·5 : 1209·7; and 1209·7 : 479·77 : : 100 : 39·7

Saving in favour of Boghead gas only = 60·3 per cent.

Again,

Candles per ft. coal gas.	Candles per ft. water and coal gas.	Cost of 1000 feet coal gas.	Comp. value of 1000 ft. coal and water gas.							
11·79	1·99	29·8	5 03; and 12·672	:	5·03	::	100	::	39·69	

Saving in favour of Boghead gas only = 60·3 per cent.

Coal and water gas.		Coal gas		Coal and water gas		Coal gas.						
1·99	:	11·79	::	12·672	:	75·077; and 75·077	:	298	::	100	:	39·7

Saving in favour of Boghead gas only = 60·3 per cent.

By this mode of operating, the above results show that the coal gas is the cheaper light by upwards of 60 per cent.

That the hydrocarbon process is not economical, is also shown by comparing the lowest results I obtained by Boghead coal alone, with the highest results by the Boghead with water. The two lowest results by Boghead alone yielded, on an average, 2969 lbs., and the two highest by Boghead and water, 3619 lbs. of sperm per ton. Taking the price the same as before, then

$$2969 : 3619 :: 479·77 : 584·8, \text{ and } 584·8 : 597 :: 100 : 102,$$

there is, therefore an increased expenditure of 2 on the 100 against the water process.

Taking the *lowest* of my results by the Boghead against the *highest* by the Boghead and water, the former is as 2856 lbs. to 3649 lbs. of sperm, by the latter. Take the expense for each, the same as before, then,

$$2856 : 3649 :: 479·77 : 612·98; \text{ and } 612·98 : 597 :: 100 : 97·3$$

Hence, under the most favourable circumstances for the hydrocarbon gas, the same amount of light can be obtained by the usual process from Boghead alone for very nearly the same expense; the difference being only 2·7 per cent. in favour of the hydrocarbon process.

I have next to advert to the trials of Dr. Frankland and Mr. Clegg.

Dr. Frankland obtained from Boghead coal alone 13,240 feet of gas, 1 foot of which was equal to 10·52 candles—that is, 2387·7 lbs. of sperm per ton of coal. From Boghead and water, he got 51·720 feet of 4-candle gas—that is, 3546·5 lbs. of sperm per ton. Taking Mr. Clegg's estimate of the cost of Boghead gas at 35d·5 per 1000 feet when the coal is at 28s. per ton, then the cost of manufacture of 13,240 feet is 470d., which gas yields the light of 2387·7 lbs. of sperm; the cost of hydrocarbon gas from the same coal at the same price, according to Mr. Clegg, is 12d·75 per 1000 feet, and, therefore, 51,720 will cost 659d., which is equal to 3546·5 lbs. of sperm: then—

$$3546·5 : 659 :: 2387 : 443; \text{ and } 470 : 443 :: 100 : 94·2$$

Therefore, to get the same amount of light, there is a saving on the cost price of the gas of 5·8 per cent. in favour of the hydrocarbon process, according to Mr. Clegg's calculation of the expense. Allowing the accuracy of this statement, it will naturally be asked how it is to be reconciled with that given by Mr. Clegg. In his report, Dr. Frankland alludes merely to the *increase in the quantity of gas* by the hydrocarbon process, and to the consequent *increase in the light* afforded by the combustion of this gas, without reference to expense. Mr. Clegg has, in addition to this, referred to the expenditure of manufacture, and consequent economy of the process. But in this last part of the statement he has made a very important omission. According to him, Boghead coal yields 13,500 feet of gas per ton, while the same quantity of coal affords, by the hydrocarbon process, 52,000 feet of 4-candle gas per foot, the candles burning 120 grains per hour; and he then assumes the saving to be to the enormous extent of 285 per cent. Were this really the case, it ought at once to ensure the universal introduction of the hydrocarbon process. In this statement, however, the increase in the *quantity of gas* only is referred to, for—

$$73,500 : 52,000 :: 100 : 385$$

But Mr. Clegg has not taken the *quality* of the gas into account. Had he done so he should haved stated the result very differently.

In his Report, it is said that the data on which his calculations are based are got from practical experiments made, first by Dr. Frankland, and afterwards by himself, with a view to test the accuracy of Dr. Frankland's Report. Though Mr. Clegg has not given the illuminating power of the Boghead coal gas to which he refers; but as he alludes to Dr. Frankland's experiments,

which he is endeavouring to verify, we may take the illuminating power given by Dr. Frankland—that is, 10·52 candles per foot.

Taking this, we shall see the result in a very different light. 13,500 feet of Boghead coal gas cost, according to Mr. Clegg, 470d., and yield the light, according to Frankland, of 2431·7 lbs. of sperm; 52,000 feet of Boghead hydrocarbon gas, according to Mr. Clegg, cost 663d., and gave the light of 3565·7 lbs. of sperm; then

3565·7 : 663 : : 2431·7 : 446.

But the Boghead coal gas for this light costs only 470d.; and

470 : 446 : : 100 : 94·8.

Accordingly, to get the same light, the saving in the manufacture is, by Mr. Clegg's own statement, only 5·2 per cent.

Again; Mr. Clegg has stated that Boghead coal per ton will yield, by the water process, not less than 75,000 feet of 2·4-candle gas per foot, and that there is thus *an increase of 460 per cent*. This statement, taken in conjunction with others in the Report, is apt to lead to the impression that there is thus a gain by the hydrocarbon process to an enormous extent; we shall find, however, on further investigation that, taking Boghead coal as before, at 28s. per ton, the cost of 1000 feet of the hydrocarbon gas, when 75,000 feet per ton of coal are obtained, is, according to Mr. Clegg, 10d.; thus making the total quantity per ton amount to 787d·5. The gas per foot being equal to 2·4 candles, the light per ton of coal will be 3085 lbs. of sperm. Here, notwithstanding what Mr. Clegg has stated regarding the hydrocarbon process in another part of the Report, that there is an "increase in volume without diminution of light," we find that there is an actual loss on the previous process. 52,000 feet of 4-candle gas are equal to 3565·7 lbs. of sperm; but 75,000 of 2·4-candle gas are equal to only 3085 lbs.; there is, therefore, a loss of 14 per cent. on the total amount of light.

With regard to the cost, the gas from Boghead coal cost, as before, 470d., and is equal to 2387·7 lbs. sperm. Then,

3085 : 787·5 : : 2387·7 : 609.

But the light of 2387·7 lbs., by the Boghead alone, costs only 470d.; and

470 : 609 : : 100 : 129·5.

Accordingly, to get the same light by the hydrocarbon process that we can get by the Boghead alone, there is, by Mr. Clegg's own showing an increased expenditure of 29·5 on the 100.

In my trials, when 75,253 feet of gas were got by the hydrocarbon process from the ton of coal, the light per foot was only that of 0·27 of candle—that is, 32·4 grains of sperm per foot, or 348·3 lbs. of sperm per ton of coal, at the cost, as before, of; then

Cost. Cost.
348·3 : 787·5 : : 3253·5 : 7356; and 479·77 : 7356 : : 100 : 1116.

Here the increased expenditure for the same light is 11·16 times the cost of coal gas alone, showing still further the loss incurred by the water process.

In the trial in which the quantity of hydrocarbon gas per ton was smaller than those above given, a loss is also occasioned. When the gas was 24,932 feet per ton, the illuminating power per foot was 6·52 candles—that is, 78·24 grains of sperm, or 2786·6 lbs. per ton of coal.

	Per ton.	
Cost of Boghead gas, as before..	16,093	479d·77
Water gas	8,839	44d·19
Total cost ..	24,932	523d·96, or 32d·5 per 1000 feet.

Then, 2786·6 : 523·96 : : 3253·5 : 612·1; and 479·77 : 612·1 : : 100 : 125.

The extra expenditure is in this case 25 per cent. for the same amount of light that I get from Boghead alone.

All of these statements still further prove that the hydrocarbon process not only is not economical, but, when carried to a great extent, is an expensive one; and it must be kept in remembrance that the above calculations refer solely to the cost of manufacture. There is no allusion to the enlarged gasholders, pipes, &c., necessary for the increased amount of gas that must be supplied to obtain the same light that is got from Boghead gas, and all of which must add materially to the expense.

I have said that there is a wide difference between the statements of Mr. Clegg and others regarding the expense of manufacturing water gas. Mr. Clegg says that it can be made at the cost of 5d. per 1000, which includes expense of materials, labour, tear and wear, &c. In the June Number of the *Journal of Gas Lighting*, reference is made to the experiments of Mgnier and others, from which it is inferred that the expense will come to 12d. From data given to me by a gas engineer of this place, it would seem to be not less than 10d. If these statements are correct—and I believe the last-mentioned is below the mark—then the

expense of the manufacture of gas by the hydrocarbon process must be far greater than what Mr. Clegg has given it, and, consequently, the loss by the use of water must be still greater than I have stated it to be.

It must, also, be kept in recollection that the expense of manufacturing gas must vary in different places, not only because the cost for materials differs, but likewise because the expense of labour, outlay on tear and wear, according to the extent of the works, is different. In taking the expenditure as given by Mr. Clegg, I have, I think, taken it at a low estimate.

The preceding remarks regarding the hydrocarbon process refer alone to its application to the Boghead coal. I have already said that I preferred that coal to others, because from the large per centage of matter condensible by chlorine which its gas contains, I considered it by far the most likely to be affected beneficially. It was my intention to extend my trials to other coals, had I obtained anything like a saving with the Boghead coal. The results of the trials I have now recorded, render it, in my opinion, quite unnecessary to take up time in trying the process with other coals. I trust that what has been written will be sufficient to prove that there is no economy in the hydrocarbon process, and that, when all things connected with the manufacture and quality of the gas are taken into account, it is a process which ought to be at once abandoned.—*Journal of Gas Lighting*.

CELLULAR BOARDS FOR LIGHTNESS COMBINED WITH STRENGTH.

The following was written by Sir Samuel Bentham, in the year 1794:

A board might be divided, then might be cut into cells by taking cylinders cut with a bit to nearly the thickness of the half board, leaving perhaps a quarter of an inch to form the surface. The two half boards, when thus honeycombed, might be glued together.

For further strength in the cementing, a kind of steady-pin, of a hollow cylindrical form, might be inserted, and glued in the cells. They might be either long enough to go to the ends of both the corresponding cells; or they might be merely rings of, suppose, half an inch broad, placed at the joint of the boards, and projecting half and half into each of the opposite cells of the two half boards.

These steady pins might be made of papier-maché, of paper twisted round a mould and glued together, or of shavings of wood made up in the same manner.

Cellular boards might also be made by connecting together the two boards intended to form the superficies. The connecting cells might be formed of hollow cylinders of various substances, according to the degrees of strength and lightness required—they might be of metal; of wood; of papier-maché. Papier-maché, composed of cheap materials, would be suitable for this purpose; a mixture, for instance, of fibrous substances—such as hemp, of sawdust, and the ordinary papier-maché composition, as a cement.

The connection of these cylinders with the boards would be much stronger if holes to the depth of an eighth of an inch were drilled in the superficial boards into which the ends of the cylinder might be glued.

M. S. B.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JULY 12, 1852.

THOMAS BARNETT, of Kingston-upon-Hull, grocer. *For improvements in machinery for grinding wheat and other grain.* Patent dated January 8, 1852.

Claims.—1. The application of wire gauze, or other suitable kind of sieve, to any orifice or opening in the lower stone, for the purpose of separating the perfectly-ground flour from that which is unground, or only partially ground, and discharging the perfectly-ground flour from the stones during the process of grinding, and before it has reached their outside periphery.

2. The application of brushes for the purpose of facilitating the said separation and discharge of the perfectly-ground flour, and of distributing the meal over the surface of the wire or other sieves fixed in the lower stone, and brushing the meal towards the outer grinding surfaces.

CHARLES DICKSON ARCHIBALD, of Portland-place, Esq. *For improvements in the manufacture of bricks and other articles made of plastic materials, and in cutting, shaping, and dressing the same, as also stone, wood, and metals; and the machinery and apparatus employed therein.* (Being a communication.) Patent dated January 8, 1852.

Claims.—1. In respect to certain brick machinery firstly described—the screening

of the clay, or other material, before delivered into the moulds; the heating of the moulding surfaces by steam, hot air, hot water, or other medium; the arranging of the moulds in a reciprocating carriage between pressure rollers; the discharging the bricks by means of carriages running on inclined planes; and the giving concave and other shapes to the tops of the bricks by means of projections on the periphery of the pressing wheel.

2. In respect of certain cutting and shaping machinery secondly described — the arrangements whereby a rocking or tumbling motion is produced, together with the apron or table attached to the rocking shaft; a direct mode of applying steam power to the production of the said rocking or tumbling motion; a peculiar combination of headstock and mode of adjusting and securing the cutting holders and cutters; a method of making the cutting discs or rings, and mounting the same between flanges; a method of using several sets of cutters in the same jaws set at different angles, and working in different planes; and the arrangements whereby the feed motion (continuous or intermittent) is obtained.

3. Certain dressing or polishing machinery, thirdly described, and the combination of arrangements whereby the dressers or polishers are lowered or raised at pleasure, and caused to act equally and uniformly on the surfaces to which they are applied.

Joseph Addenbrooke, of Bartlett's-passage, Holborn, envelope manufacturer. *For improvements in the manufacture of envelopes, and in machinery used therein.* Patent dated January 8, 1852.

For description of Mr. Addenbrooke's machine, see the first article of our present Number.

Alcide Marcelin Duthoit, of Paris, statuary. *For an improved chemical combination of certain agents for obtaining a new plastic product.* Patent dated January 12, 1852.

This invention consists in combining with gutta percha previously prepared for the purpose, oxide of zinc, purified or otherwise, fusible spar (sulphate of barytes), and amianthus, in combination with various colours, thus producing a new plastic composition. The gutta percha is to be prepared and bleached by dissolving it in rectified naphtha, or benzole, or sulphuret of carbon, or other solvent, and is then mixed with the other ingredients in the following proportions:

First Composition. One part of gutta percha, and one part of oxide of zinc.

Second Composition. Equal parts of gutta percha and fusible spar (sulphate of barytes).

Third Composition. Equal parts of gutta percha and amianthus in the state of powder, or dissolved in rectified naphtha or benzole. When the compounds do not possess sufficient elasticity, caoutchouc dissolved in naphtha, or benzole, may be added to them.

In compounding the mixtures above-mentioned, the patentee operates as follows:—He first dissolves the gutta percha in the naphtha, and then, after filtration, places the solution in a still, and adds the oxide of zinc, fusible spar, or amianthus, together with the colour to be employed, and stirs the whole well together. The still is then heated by a balneum mariæ, steam, sand, or other means, and the heat maintained until the volatile liquid used is driven off. The composition is then removed and moulded into the articles which it is desired to produce. Instead of introducing the colouring matter in the still, it may be mixed with the composition by masticating in warm water, rendered alkaline by the solution therein of crystals of soda.

The compositions produced as above are suitable for making models, tissues, moulded articles of various kinds, artificial flowers, and, when rolled into sheets, may be used as a substitute for leather, and applied to all the purposes for which leather is used. They may also be diluted with naphtha or benzole to any desired consistence, and applied as liquid paints.

Claim.—The production of a new composition or plastic product susceptible of receiving any required colour or shade of colour, and the application of the same to manufacturing purposes, as described.

Robert John Smith, of Islington, gentleman. *For certain improvements in machines or apparatus for steering ships and other vessels.* Patent dated Jan. 13, 1852.

Claims.—1. A grooved concentric tiller head, or disk, fixed or keyed upon the cap or upper portion of the rudder shaft, which the patentee calls a "drum-head."

2. The intervention of a yoke, or lever, for increasing or multiplying the speed of the said drum-head.

3. The application of a grooved spiral screw and socket shaft motion of whatever length of rake or size of thread employed for obtaining a transmitting power direct from the steersman to the rudder, by which the half-turn of the steering wheel is affected.

4. The application of a yoke, or segment beam, for transmitting increased motion from the tiller direct to the rudder.

5. The application of auxiliary power (derived from steam or other convenient source) to steering machines or apparatus generally, so that the operations of the helmsman may be greatly assisted thereby.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Joseph Jepson Oddy Taylor, of Gracechurch-street, London, machinist, for an extension for the term of four years, from the 1st day of May last, for part of his invention described in the original letters patent under the title of, "An improved mode of propelling ships and other vessels on water." July 6.

Warren Stormes Hale, of Queen's-street, Cheapside, candle-maker, and George Roberts, of Great Peter street, Westminster, miner, for improvements in the manufacture of night lights or mortars. July 8; six months.

Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman, for improvements in machinery for cutting soap into slabs, bars, or cakes. (Being a communication.) July 10; six months.

Thomas Jordan, of Old Broad-street, London, for improvements in disinfecting essential oils, and in treating fatty matters obtained from shale schistus, or other bituminous substances, and in retorts employed in distilling such minerals. July 12; six months.

Joseph Baron Palur, of Castle-street, Holborn, for an improved mode of baking bricks, tiles, and other kinds of pottery or earthenware. July 13' six months.

Charles Burrell, of Thetford, Norfolk, and Matthew Gibson, of Rollington-terrace, Newcastle-on-Tyne, for improvements in reaping machines. July 15; six months.

George Hinton Bovill, of Abchurch-lane, London, for improvements in manufacturing wheat and other grain into meal and flour. July 15; six months.

Moses Poole, of the Patent-office, London, gentleman, for improvements in boots, shoes, clogs, and similar articles. (Being a communication.) July 15; six months.

Henry John Gauntlett, of Charlotte-street, Portland-place, Middlesex, doctor in music, for improvements in organs, seraphines, and other similar wind instruments, and also improvements in pianofortes. (Being a communication.) Ju'y 15; six months.

Charles Barrington, of the City and County of Philadelphia, in America, gentleman, for an improved steam boiler water-feeding apparatus, and furnace therefor. (Being a communication.) July 15; six months.

Charles James Pownall, of Addison-road, Middlesex, gentleman, for improvements in the treatment and preparation of flax and other similar fibrous vegetable substances. July 15; six months.

Thomas Richards, of St. Erth, and Samuel Grose, of Gwinear, both in Cornwall, for certain improvements in machinery for reducing and pulverizing ores, minerals, stones, and other substances. July 15; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
July 8	3324	C. Burrell	Thetford	Force pump discharge apparatus.
9	3325	W. Hensman and Son, and S. L. Taylor	Woburn, Bedfordshire; Cotton-end near Bedford	Steam engine controller.
,,	3326	R. E. Branford	St. Leonards and Hastings	Daguerreotype accelerator.
,,	3327	W. Dray and Co.	Swan-lane, London-bridge	Lever and extended horse rake.
,,	3328	J. Symonds	Circus, Minories	Gold-washing cradle.
,,	3329	J. Classon	Dublin.	Steam boat and railway chess-board and men.
10	3330	J. Crawley	Silver-street, Cheapside	Arm-hole shirt front.
12	3331	J. R. Isaac	Liverpool.	Perpetual remembrancer.
14	3332	G. P. Thomas	St. James'-street.	Adjustable clog fastening.

WEEKLY LIST OF PROVISIONAL REGISTRATION.

July 14	442	Myers and Son	Newhall street, Birmingham	Postage stamp holder.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Joseph Clinton Robertson, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1511.] SATURDAY, JULY 24, 1852. [Price 3*d*., Stamped 4*d*.

Edited by J. C. Robertson, 166, Fleet-street.

ARCHIBALD'S PATENT BRICK-MOULDING MACHINERY.

Fig. 1.

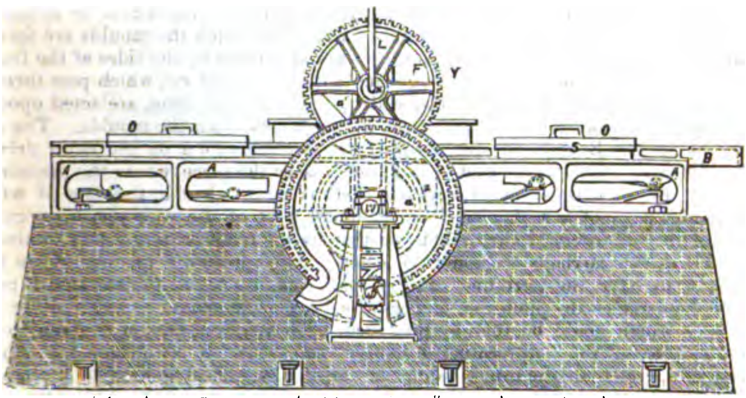


Fig. 2.

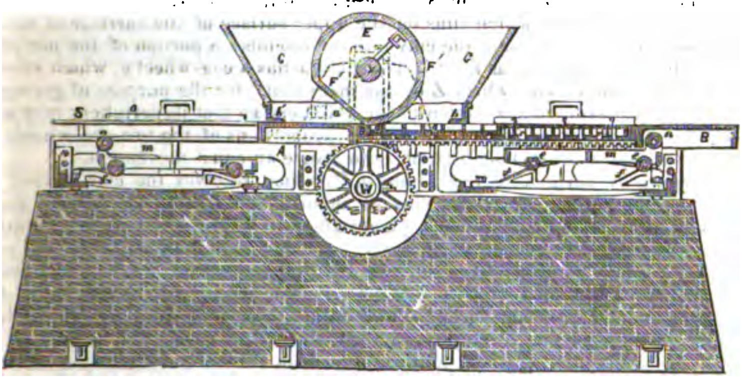
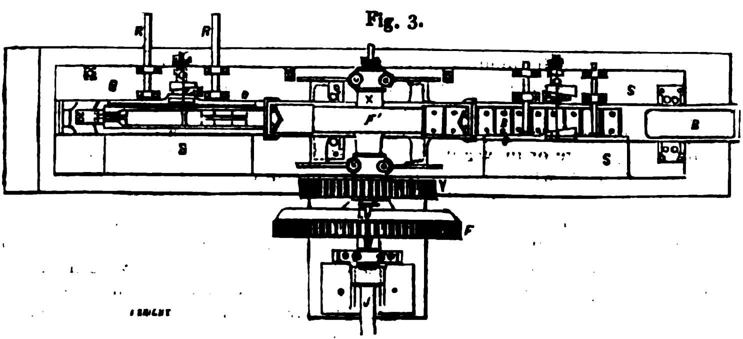


Fig. 3.



ARCHIBALD'S PATENT BRICK-MOULDING MACHINERY.

We gave at the time of its enrolment the claims made in Mr. Archibald's Specification (see *ante* p. 58), and have now the pleasure of laying before our readers a full description of that part of the invention which has relation to "the manufacture of bricks and other articles made of plastic materials."

Figure 1 is a side-elevation of the apparatus; figure 2 a longitudinal vertical section; fig. 3 a plan; fig. 4 a cross vertical section; and fig. 5 a detached view, on an enlarged scale, of one part of the apparatus (the pressing-wheel or cylinder). AA represents the frame; B is the main carriage in which the moulds are formed or arranged, and which slides between the ways *ss* formed by the sides of the frame. To the moulds are fitted followers *q*, each with two stems *r r*, which pass through holes in the bottoms of the moulds, which, at the proper time, are acted upon to force up the followers for the discharge of the bricks from the moulds. The carriage of moulds B runs on the periphery of two rollers *a a* on the main driving shaft *w*, which rollers are placed immediately under the place where the pressure is applied. Between these two rollers *a a*, there is a cog-wheel *c*, the cogs of which engage the cogs of a rack placed on the under part of the carriage, between the stems of the followers of the moulds, so that by the reciprocating rotary motion of the shaft *w*, the carriage of moulds B receives a reciprocating motion. Care is to be taken to have the periphery of the rollers *aa*, on which the carriage B rests, of the diameter of the pitch line of cog-wheel *c*, so as to avoid slipping and the tear and wear which would be thereby produced. The required motion is given to the main shaft *w*, for the reciprocating motion of the carriage B, my means of a mangle-wheel F, operated in the usual manner of the mangle-wheel motion by a pinion G and guide roller I, on the end of a rotating and vibrating shaft J. Above the main shaft, and in the same vertical line with these is another shaft *x*, which carries a cylinder F^1, the periphery of which runs on the upper surface of the carriage of moulds B, for the purpose of pressing the clay into the moulds: a portion of the periphery of this cylinder is cut away as at a^1. The shaft *x* has a cog-wheel *y*, which receives motion from another cog-wheel Z on the main shaft, for the purpose of giving the required reciprocating rotary motion to the cylinders, so that its periphery may move with the carriage of moulds. The relative proportions of the two cog-wheels and the cylinder should, of course, be such as to insure an equal movement.

The cylinder is surmounted by a hopper C, which receives the clay to feed the mould; but to separate from the clay all rubbish and foreign substances, and to prepare it properly for mixing and pulverizing, it is previously passed through a screen. The screen should be about eight feet long by three in diameter, and made to revolve upon a stationary wrought-iron shaft, to which iron crushers or breakers are attached. The screen is inclined at a convenient angle, and the clay is fed in at the higher end. In passing through, it is mixed and pulverised by the crushers, the finer particles passing through the screen, whilst the stones and impurities fall out at the lower end. Motion may be given to the screen by any convenient means.

From the hopper the clay is delivered to the moulds, and as the carriage runs under the cylinder it is forced and impressed into the moulds by the periphery of the cylinder; then, as the moulds move on towards either end of the machine, the bricks pass under the sharp edge *b*, at the end of the hopper, which strikes off the surplus clay (should there any), and so soon as the moulds have passed from under the hopper the end of the rack of the carriage strikes against a roller *n*, at one end of a secondary carriage or moveable platform *m*, mounted on rollers *e*, *e*, which run on inclined ways *f*, *f*, when the upper surface of the carriage or platform comes in contact with the stems of the followers of the moulds, and forces them up to discharge the bricks from the moulds. The roller *n* at the end of the rack allows the platform to rise with but little friction. There is a like arrangement at each end and two sets of moulds in the carriage, so that a set of bricks may be moulded as the carriage moves in either direction. At the end of either movement of the carriage a pin strikes against a pin which projects downwards from the under face of a wedge P, which pin slides in a slot in the frame of the machine, and this wedge

acts against a bar *o*, to push the discharged bricks from the surface of the follower. As soon as this bar is started, the attendant draws the bar by hand to remove the bricks. The bar is carried back when liberated by the attendant, by a weight attached to a cord passing over a pulley, as shown in the engraving, and the weight should be sufficient to force back the wedge as soon as it is relieved by the back motion of the carriage. A like arrangement is employed at both ends.

Fig. 4.

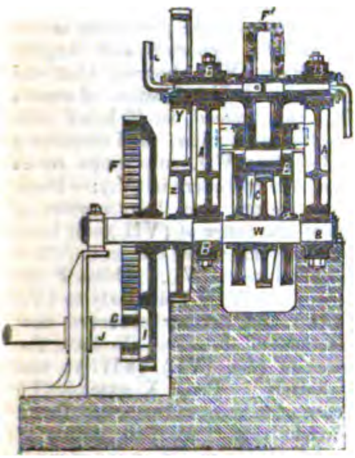
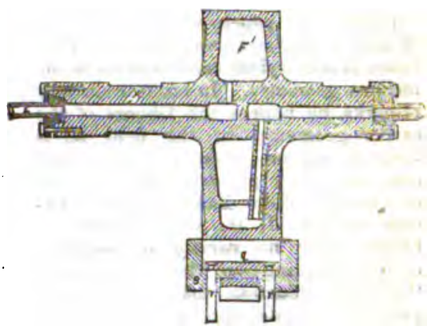


Fig. 5.



The pressing cylinder F^1, is made hollow, as also its shaft, and to one end of the shaft is coupled by a turning-coupled joint a steam pipe L, which leads from a steam boiler or generator, and to the other end is coupled in like manner an exhaust pipe. By this means a current of steam is kept passing through the cylinder to keep it in a heated state, which artificial heat of the surface prevents the clay from adhering to the surface of the cylinder. There is a partition I in the bore of the shaft which prevents the steam from going directly through the shaft to the exhaust pipe, and therefore compels it to pass through the hollow cylinder; and the shaft on that side of it towards the exhaust part, is provided with a pipe which extends towards, and near the inner periphery of the cylinders, so that the steam can only escape through this pipe. The principal particulars in respect of which the machinery before described differs from other machinery heretofore employed for moulding and pressing of bricks, and other articles made of plastic materials are these. *First*, the screening of the clay previous to delivery into the moulds. *Second*, the arranging of the moulds in a reciprocating carriage placed between two pressure-rollers, so that the clay in the moulds is subjected to the pressing action of the rollers, first in one direction, and then in the opposite direction, thus equalizing the density of the brick. *Third*, the discharging of the bricks from the moulds by means of carriages running on inclined planes. *Fourth*, the heating of the moulding and pressing surfaces, whereby the adhesion of the clay to the same is prevented, and the drying and hardening of the bricks accelerated;—and, *Fifth*, the placing of projections on the periphery of the pressing wheel, so as to give the top surfaces of the brick a concave, or any other required form. Of the fourth of these particulars it may be observed, that the method of preventing adhesion of the clay by heating the moulding surfaces, is equally applicable to the platen of a reciprocating press, as also to the bottom or followers, and the sides of the moulds, for which purpose these parts may be made hollow and provided with pipes for the admission of steam. It will be further obvious, that any other means of artificial heating may be substituted for steam, such as passing hot water or heated air through the hollow parts.

MATHEMATICAL PERIODICALS.

(Continued from p. 9.)

XXVII.—*The Mathematical Repository.*—(*Original Papers Continued.*)

Art. X. and XVII. Part II. Vol. V. Researches in the Geometry of Three Dimensions. By Mr. T. S. Davies, Bath. Section the First. On the Contracts of the Sphere, Cylinder, Cone, and Wedge.

Section the Second. The Conjugate diameters and diametral planes of the Second Order.

[These two papers are continuations of each other, and contain the late Professor Davies's *first* contributions to the modern geometry. In his introductory remarks, he notices the labours of the earlier geometers in the field he is about to explore, most of whose speculations "are preserved in the works of the Rev. John Lawson," but "except by Mr. J. H. Swale," their solutions offer no *variety of method*, each proceeding on the principle of "gradual reduction, making the more *general* case depend upon some one more simple." The foreign methods, he observes, are the *reverse* of these, since they "commence with the most *general* case of the problem, and consider all the others as particular cases." Under this form, "the writings of Morge, Hutchette, Gergonne, Durrande, Gaultier, and Steiner," contain a "series of speculations as beautiful as can perhaps be boasted by any branch of geometry whatever, so purely elementary;" and since, "even as left by them, the subject is far from being exhausted;" he begs, therefore, to add his "mite to the common stock."

Prop. I. enunciates the property that if there be "two pairs of circles (A), (B), and (G), (H), touching one another symmetrically, then the *centre of similitude* of either pair will be on the *radical axis* of the other pair;" and Prop. II. discusses the several cases of the two centres of similitude, according as the original circles are *directly* or *inversely* symmetrical.

Prop. III. notices the fact "that if any number of *variable* circles, (G), (H), &c., be described to touch two *permanent* circles (A), (B), the mutual tangents to (G), (H), &c., taken two and two, will always intersect in the same straight line;" and hence Prop. IV. is deduced, which states that "whatever circles be drawn to touch two circles (A), (B), or to cut them in C, D, which are upon an axis of similitude, the tangents to them from S (the centre of similitude) will be equal."

Prop. V. extends the preceding to the case of variable cylinders and tangent planes:—Prop. VI. observes that the same properties hold "if instead of circles in (III.), or, indeed, in (I.), we substitute ellipses similar, and similarly placed:"—Prop. VII. substitutes *cones* instead of the cylinders in (V.):—Prop. VIII. determines that "any system of sections of the cones of (VII.) will have the same property as the circles in (III.), or the cylinders in (V.)," whilst Prop. IX. generalises (VIII.) similarly to (V.) and (VII.), and further observes that "any sections of these will also have the properties of (I.), (VI.), (VIII.); and so on infinitely." Prop. X. extends (I.) to the case of tangent spheres, and Prop. XI. remarks that "the four points of contact of four spheres are in one plane," as had been before stated by Hutchette. Prop. XII. demonstrate that "if variable spheres touch *three* permanent ones, the centres of the variable enveloping cones, will always be in one straight line;" and the property that "if two permanent right cones be touched by two variable right cones, all issuing from the same centre, then the tangent planes to the variable cones will always intersect in the same plane," is elegantly investigated in Prop. XIII. In Prop. XIV. "the variable cone enveloping two variable spheres, each of which touches two concentric right cones, or two parallel right cylinders" is proved to have its "vertex in the same plane;" and Prop. XV. enunciates the property that "if from any point S, two angles are drawn, and *any* circles (G), (H), be desirable to touch the sides of the angles; then the intersection S′ of the tangents to (G), (H), will always be in a straight line SS′." Prop. XVI. extends this property to "variable right cylinders inscribed in two wedges, whose edges are coincident," as does Prop. XVII. to the case of "two variable spheres in two wedges of coincidental edges;—the tangent planes in

the former, and the enveloping cone in the latter case, being shown to meet, or have the vertex in the same plane. In Prop. XVIII., it is shown that if "two concentric variable cones, whose common centre is in the common edge of two wedges, be touched by tangent planes; these tangent planes shall always inter- in the same plane," whilst Prop. XIX. is devoted to an indication of more general results, since, "in all cases, instead of *vertices of the enveloping cones* we might have said *centres or axes of similitude*, and thereby have given greater generality to the propositions." Prop. XX. demonstrates the property that if "upon the surface of the sphere there be two permanent circles (*a*), (*b*), and these be touched by two variable ones (*g*), (*k*); then great circle tangents to these two variables will always intersect in the same great circle of the sphere;" and Prop. XXI., "by comparing (XI.) with (XX.)" deduces the spherical analogy "that if two circles upon the sphere touch two others symmetrically, the four points of contact are upon another circle of the sphere, the same which takes place when the four circles are on a plane."

In the second section, the first three paragraphs are devoted to the enunciation of principles and definitions;—the fourth contains the theorem of Monge, viz., "if a cone (C) having its centre *c* in one of the reciprocal conjugates, envelope a surface (S), then the plane of contact (P) shall envelope the other reciprocal conjugate of (S);" and the fifth proves that "no other surface than the cone has that quality." Paragraphs VI. and VII. relate to the inscription of lines in surfaces, from which he deduces the property that "if two lines of the second order be inscriptible in one surface of the second order, they are capable of innumerable inscriptions," and also that "if two lines of the second order are inscriptible one way in a cone, they are capable of the other inscription," (inward or outward). In IX. we have the enunciations of two theorems on the same subject, due to Brianchon and Monge, which are subsequently extended to more general forms; and by combining (VI.) and (VII.) we obtain X., which elicits the property that "if three sections taken, two and two are inscriptible, they are all three inscriptible in the same surfaces of the second order." The property in X. is stated in XI. to be "one of the most fecund in this method of inquiry that can be proposed;" but Mr. Davies contents himself on this occasion by deducing "from it one single proposition;" viz., that "if any three sections of the second order be about the same diameter, they can be incribed in a surface of the second order," as had been previously noticed by Dupin in his *Develop. de Gèomètrie*, p. 60.

Par. XII. and XIII. give geometrical and analytical demonstrations of the property that "there is always one point, and but one, from which tangent cones being drawn to two given surfaces, the planes of contact will coalesce;" in XIV. this is rendered subservient to a demonstration of Ques. 1258 of the *Gentleman's Diary* for 1829, which had been proposed for solution by Mr. Davies; and in XV. the property is extended to a much more general one as follows:—"If two surfaces of the second order intersect, there are innumerable surfaces of the second order which have a common section with them," where it is remarked that "*the cone in* (XIII.) *is a particular case of this*." Paragraphs XVI., XVII., and XVIII., conclude this valuable collection of theorems and results, by noticing "some propositions respecting cones of the second order in different planes, analogous to those in the former paper concerning circles on the same plane;" the first of these suggests that "the properties established concerning circles are true concerning similar conic sections similarly placed, *on the same plane*;" the second proves the theorem that, "if two sections (*s*), (*s'*), of a surface of the second order (S) be given, and any two other sections (*s''*), (*s'''*), be described tangential to these, then the cones enveloping these latter sections, and having their vertices internally situated, these vertices will be in the same straight line;" and the third remarks that "the *internal* cones will have their vertices all in one plane, viz., the reciprocal conjugate of the cone which envelopes (*s*), (*s'*)."

Art. XI. Dynamical proposition and problem on the progressive and rotatory motion of a body in free space. By Mr. Mason.

[This paper corrects the solutions of Ques. 450, New Series of the *Reposi-*

tory, and Ques. 1225 in the *Gentleman's Diary* for 1828.]

Art. XII. A corrected solution to Ques. 1225 in the *Gentleman's Diary*. By Mr. Samuel Jones.

Art. XIII. A dynamic problem. By Mr. W. S. B Woolhouse.

Art. XIV. On the property that every equation has a ro‹t. From *Dévelloppemens*, &c., by Reynard and Duhamel; communicated by the Rev. S. Hawkes.

Art. XV. On the principle of least action. By the Rev. Edmund Sibson, of Ashton, near Warrington.

[This paper is illustrated by solutions of the Prize Questions from the *Ladies' Diary* for 1828, and Ques. 105, vol. I., *Leybourn's Repository*.]

Art. XVI. On the stereographic projection. By Mr. T. S. Davies, of Bath.

Part I. Historical.

Part II. Geometrical.

[In the first part of this Essay, Mr. Davies lays down the three principal properties of this kind of projection, viz., "1. That all circles are projected into [lines or] circles; 2. That the tangent of any arc and its projection are equal; 3. That the angle contained by any two circles is equal to its projection." He then shows that the first of these properties was known to Hipparchus and Ptolemy, although, "as a universal truth, it was first given in the *Planisphærium Fordani*, published at Toulouse, in 1544;" but with regard to the second and third properties which "follow at once from the method of Jordan," he was not able to assign an earlier authority than the "Dictionary of Savérein," published in 1753. Professor De Morgan has since shown (*Penny Cyc.*, *Art. Stereographic*) that the property (3) occurs in Dr. Harris's "*Lexicon Technicum*" (1716), and has been attributed by Dr. Halley to De Moivre or Hook. The second section contains a collection of solutions of the property (1) and its extension to surfaces of the second order.

1. The solution of Jordan, firstly, improved; secondly, "literally translated."

2. Mr. Davies's "demonstration of the property in reference to surfaces of the second order," which comprehends the theorems of Legendre and Hatchette.

3. The demonstration by M. Chasles from the "*Corresp. Polyt.*, tome 3, p. 16."

4. The analytical demonstration of the general property, by M. Chasles, from the "*Supp. Hatchette*," p. 271.

5. Mr. Davies's *geometrical* proof of the "beautiful property annexed by M. Chasles to the Ptolemaic one."

6. Mr. Davies's demonstration of the *second* and *third* properties.

In all of these discussions the elegance and ingenuity of the investigations are only equalled by the extensive reading and profound research of their gifted author. The introductory portion of most of the papers published in the *Repository* will be found of considerable value to the historical student; nor will the more strictly scientific reader regret the careful examination of these little-known, but most instructive essays. We may further add that the same properties of this projection are elegantly demonstrated in pp. 385-7 of the "second volume, containing the geometry: By T. S. Davies, Esq., F.R.S., L. and E.," of an "Elementary Course of Mathematics, prepared for the use of the Royal Military Academy," and published since his death under the superintendence of Mr. Fenwick.]

Art. I., Part III., Vol. V. On the determination of the attraction which a planet would exert upon any point given by position, if its mass were distributed along the whole orbit, uniformly in relation to the time in which each part of the orbit is described. By Charles Frederick Gauss.

Art. II. A new solution of the problem, in which it is required to inscribe three circles in a given triangle, so that each of them may touch the other two, and also two sides of the triangle. By M. Lechmutz. [Malfatte's Problem.]

In the *first* part of this volume, pp. 103—209 are occupied by tolerably lengthy memoirs of Playfair, Hutton, Dalby, and Laplace, most of which appear to have been prepared with considerable care: the latter portion of the volume (pp. 1—144) contains the "Cambridge Problems" from 1820 to 1829 inclusive.

T. T. W.

Burnley, Lancashire,
July 14, 1852.

(*To be continued.*)

A Bill to enable parishes and boards of guardians to raise funds to meet contributions from Australia for the purpose of juvenile emigration, was laid on the table of the House of Peers by the Earl of Shaftesbury, but by the advice of the Earl of Derby was withdrawn, on the ground that during the recess of parliament, were the bill printed and circulated objections were likely to be made to it. This withdrawal is perhaps to be regretted, since whether the provisions in the bill were good or otherwise, discussion of them seems desirable, the measure proposed being of so much importance: of importance to the rising generation of paupers, to the industrial, and to the independent members of society at home, to our Colonies, and to those of our manufactures which depend upon Australia for a supply of her superior wools. Where interests so great and various are involved it may be well worth while to bring together objections that are likely to be made, and to consider how far they may be valid.

The binding pauper children to responsible persons at the Cape of Good Hope has been objected to on the score of its being an encroachment on the liberty of the subject, and in this instance has prevented a suitable provision for many poor children; but the objection has been overruled in the parish of St. Pancras, from whence a few pauper children have been articled to residents in the Island of Bermuda. The success of this experiment is encouraging; one of these apprentices, just come home to see his friends by leave of his master, has on examination, not only afforded evidence of his own happy lot, but also of the welfare and happiness of the other pauper apprentices in that island.

Propounders of this objection seem to have forgotten that paupers *never* have choice as to the *place* in which they are to be gratuitously maintained. On the contrary, they are habitually passed to that parish in which they have a legal settlement, an arrangement devised and enforced for the purpose of relieving rate-payers from the burden of any but their own poor. Thus, Irish paupers are continually being sent from various parts of England to Ireland much against their will. Australia, like Bermuda, is as much a part of the British dominions as is Ireland; and by the simple expedient of sending no pauper to Australia but with his own consent, he would have an option which is not now allowed him in either Great Britain or Ireland. As regards children, the Legislature has given guardians of the poor a power of binding the child to some master of their choice, without restriction as to town or country, or as to the kind of service to be exacted from the apprentice. There may be instances where it would be hard to sever a pauper child from relatives who, though poor, might love him, but the greater part of pauper children are either orphans, or have been deserted by their parents. At Swinton, for example, when the whole number of children in the establishment was 630, 429 of them were either orphans or deserted. On the score of home relationship, there could be no objection to sending away from Manchester this two-thirds of the children at Swinton.

It was said by Lord Desart, in the House of Peers, that children on board ship are more subject than adults to disease and death, and that children communicate disease to adult passengers. These are the reasons given by the Land and Colonial Commissioners for limiting their assistance for emigration to persons not having more than four children under 12 years of age.

This objection is in contradiction to the general impression that children suffer less than adults in a voyage by sea; nor does the objection appear to be supported by any authentic documents. That a greater portion of young children than adults should die on board ship is but in conformity to the well ascertained fact that it is the same on shore, where three-fifths of children born die before they have attained their fifth year. This is the *general* average including all ranks, but it is believed that the mortality is much more considerable amongst the poor than the more wealthy classes; however this may be, the general average should at least be taken into account, and a corresponding proportion of infant deaths be expected. It should further be borne in mind, that the adult passengers forwarded by that Commission are at the most healthy period of life, from

14 to 45; and thus again, the proportion of childrens' deaths be likely to *appear* to exceed the average.

A late authentic document does, however, throw light upon this question; at the desire of the Secretary of the Land and Colonial Commissioners a correspondence relative to emigrants from the Isle of Skye to Canada, was published in the *Times* of the 10th instant, by which it appears that "1,681 souls" shipped from Scotland had been landed at Quebec, "less 5 adults, 3 infants." This party consisted of adults 1,022, children between the age of 1 and 14 years 602, infants 57; thus it is proved, that although there had been five deaths of adults, and three of infants, yet of the 602 children from 1 to 14 years of age, *not a single child had died.*

As to children communicating disease to adults on board ship; this would seem to need well authenticated documents to prove it, but none such have been produced. There certainly are disorders communicable from children to adults, as hooping-cough, measles, &c.; but with few exceptions adults have already gone through these ordeals that so rarely recur a second time. Some other diseases are contagious, as scarlet fever, but on board ship they are as likely to originate in the adult as the child, especially as the latter is not there exposed, as in a school, or in the street to be infected by a playmate.

There are, however, some causes of suffering to children under present regulations in regard to transports, such as deficiency of nourishing food, want of air, and want of exercise. The passage-money for a child under 14 years of age is but half the sum paid by adults; food and accommodations are of course in proportion to their pay. The half of a man's ration may be abundant for the child of five or six years old, but is rarely sufficient at twelve or thirteen years of age, the growing child of these years often requiring as much nourishment as the adult, say sometimes more. The rations of children should consequently be regulated according to the age of the child to be fed.

Bed, sitting, and standing-room may be in proportion to stature, without injury to health; but there are other particulars which do not seem to have been sufficiently attended to in regard to juvenile emigrants, namely ventilation, suitableness of food as to kind, exercise.

It is believed that, after early infancy, the adult can better than the child withstand the deleterious effects of deficient ventilation; and it is well known that, however perfect may be the arrangement of pipes in the ship for carrying off foul air and introducing fresh, there are times, as during calms, when such pipes are of little or no avail. Some more artificial mode of ventilation seems, therefore, essential to the preservation of health in a crowded vessel; and further, that a regular use of such an apparatus should be enforced. "It would be easy to fix such an index or tell-tale to the valve of a ventilator as would show at any time the number of strokes it had made."* It seems needless to repeat the observations on this subject which have already appeared in the Magazine (*ante*, No. 1326), when, on the occasion of the loss of life on board the *Londonderry*, effectual means of ventilating a ship were indicated, and precautions pointed out which seemed necessary for the prevention of injury to passengers on the introduction of fresh air for ventilation.

As to the food furnished to emigrants, a great part of it consists of farinaceous substances, upon which it is well known that peasant children thrive, supposing that milk and fruit be added in countries where meat soups are not used; milk on board ship is out of question: some cheap dried fruits might advantageously form a part of the dietary, particularly figs. In so far as salted meat is given to children, it may be doubted whether the nourishment afforded by the fibrine may not be overbalanced by the destruction of other component parts of flesh that are essential to nutrition, and whereby sea-scurvy has so often been induced. One of the important component parts destroyed by salt is gelatine, and this part might be furnished at a cheaper rate than any other kind of food whatever. Many particulars as to this jelly have already appeared in No. 1490 of this Magazine, where it is shown that the quantity of gelatine required for a pint of rich soup, sufficient for the portion of a working man, could be furnished

* Sir Samuel Bentham's "Minute" at the Navy Board, 8th August, 1811.

for about a halfpenny when dried as portable soup, and that it would not weigh above half an ounce, and that it is not of a perishable nature.

Want of exercise on board ship may be considered as injurious to children, both mentally and bodily,—motion in early age being essential to health, and indulgence in it requisite to a child's content; this cannot be permitted where there are adult passengers likely to be annoyed by boisterous games and noise; it would seem, therefore, that were pauper children to be sent to Australia, it would be desirable that no adult passengers should be taken in the vessel—placing the children under the care of a due number of superintendents and instructors. Supposing from five hundred to a thousand children to be dispatched in the same ship, it would be well worth appointing a good matron or master, competent scholastic instructors, a surgeon, and a chaplain, besides two or three inferior functionaries. Neither would it be amiss to provide means of exercise so far as the confined limits of a sea-going vessel would permit, such as some of the least bulky apparatus for gymnastic exercises; even the berths themselves could be scrambled up and down when the bedding could be on deck; and this, it should be observed, should be daily; each child should neatly roll up its own bedding, carry it on deck in the morning, and bring it down again at night. This *daily* airing of bedding was considered as a chief cause of the good health of soldiers in a transport carrying a thousand men last war to the West Indies. It happened that they were kept on board for thirteen months, yet the mortality amongst them was *less* than the average of deaths in England. Were emigrant passengers children only, they might be allowed at certain hours to jump and halloo at their pleasure; boys might play at leap-frog between decks, though there might not be room to trundle hoops; and several of them might be initiated in some of the operations required for manœuvring the vessel.

It would seem desirable that boys and girls should not be sent in the same vessel; the treatment to be observed in regard to the two sexes being different in some respects, and it is obvious that modesty in the female must often necessarily be waived in the confined limits of a ship where both sexes are intermixed. The superintendents, too, are different for boys and girls, as are the instructions to be given them and the work they have to execute. In point of economy, too, it would cost less to have one good master for 1,000 boys, one good mistress for as many girls, than to provide two indifferent masters and two such mistresses for an equal number of children, half boys half girls, on board each ship.

The Earl of Shaftesbury stated, in the House of Peers, that "Captain Stanley Carr, an Australian gentleman of great experience, said,—'The emigration of pauper children was preferable to that of adults.' He dwelt on the mischiefs resulting from the unnatural disparity of the sexes in the colonies. He showed that the evil could not be remedied by sending out women, not merely because their number was deficient, but because their characters were suspected. He thence inferred that girls should be sent out before the age to which the least suspicion should attach; and he proposed the experiment of establishing a small industrial school for girls in the colony with which he was himself connected, and of fitting them, by an education of not less than a year, to become useful servants and eligible wives. Let any man try the question by his own experience, and then pronounce."

What is the age at which suspicion may attach? Alas! experience in the habits of the lower orders renders manifest that the germs of immorality have taken root long before the usual age of apprenticeship; and that both in boys and girls. Daily witnesses of immorality, as too many children are, whether at home or in a workhouse, accustomed to hear gross language and profane discourse, the mind is very frequently contaminated at a very early period; consequently, the earlier children are removed from evil example, the better for them and for society at large. Australia could not be expected to charge itself with the rearing of mere infants; the law, as well as custom, defines infancy as being past on the attainment of the seventh year; that age might be fixed upon as the earliest at which a parish might be authorised to deport its paupers, and the earliest at which

Australian colonists should engage their services. There is abundant evidence that a child of eight years old can earn its livelihood there; the child of seven years would have attained its eighth year during the voyage, and before the expiration of the year's schooling proposed by Captain Stanley Carr; so that Australians would not be exposed to loss by taking children from this country at seven years of age. Indeed, long before they are found to be useful at home, and examples are not wanting of their being so in field occupations, some of them seeming little suited to their years; for instance, leading oxen to pasture, yet the daughter, not six years old, of a small farmer, near Montauban, regularly took his oxen to the field as soon as they came in from plough.

Examples afforded by infant schools prove that at seven years old children already have learned to read, to write, the four first rules of arithmetic, knitting, and plain needlework. What more of this head of education does a shepherd or farm-servant in the bush require to know? Or amongst females, the maid of all work, the housemaid, or the laundress? Or, when she marries, is more of this description of learning required? It might be hoped that parish authorities would turn their attention to the providing this instruction for all the infant paupers under their management, so that when taken for Australia, they would only, during the passage, have to keep up what they had already learnt.

Employment during a long voyage is as necessary to sustain the health and spirits of the young as of the adult—even a child tires of mere play, and is as cross and peevish when it has nothing to do, as when it is kept long at the same occupation; were it on this account alone, it would be expedient on board ship to vary a child's employment, keeping it a longer or a shorter time at the same work or exercise according to age. It has been found among female emigrants highly conducive to general harmony when they have been supplied with needlework and knitting materials, and some kinds of work have been proposed for many; in regard to pauper children emigrating, it seems expedient that during the voyage they should be taught what would be most useful to them in Australia, and, at the same time, what could be most easily acquired within the limits of their floating house. Girls have needlework and knitting, which neither of them need either much space or costly materials. Why should not boys be afforded the same occupation for the present, and thereby be practised in arts that could not fail of being useful in the bush? Thorns will tear jackets in Australia as they do in England, and running after sheep and cattle wear holes in shoes and stockings; a little knowledge of tailoring, cobbling, and knitting, would enable the shepherd or herdsman to put the "stitch in time to save the nine." There is many a tailor, many a cobbler, who would be glad to teach his art while at sea for no further remuneration than a free passage; materials to work upon would be the greatest difficulty; but this might be obviated. Instead of furnishing pauper children with new apparel, they might be shipped in their old clothes, and have materials for the new put on board; their first lessons would be in repairing things as they wore out, and afterwards in making up the new. So they might knit new feet or heels to old stockings, drawing out half-worn threads to be worked up anew; and so of other parts of dress they might be taught the very useful lesson of turning every article to the best account.

The interest of parishes at home, and the welfare of pauper children has been more considered above, than the way in which Australians would be reimbursed the expense they would incur in rearing pauper children; but it has been taken for granted that their apprenticeship to the master was intended, so that their services towards the end of it might compensate for the cost and care bestowed upon them. In this country, parish poor are bound to the age of twenty-one years. It may be a question whether in Australia an earlier age might not be more suitable; say, for the moment, eighteen. Previously to about that time of life, the lad or maiden submits willingly to restraint, but, at an age much more advanced, is eager for emancipation—is apt to become unruly on that account, or otherwise despondency lessens the exertion of the apprentice, and, consequently, degrees of usefulness to the master. But this is a subject which requires much consideration, and fur-

ther development, than it is either necessary or useful to enter into on the present occasion.

M. S. B.

REFLECTORS IN LOCOMOTIVES.

Sir,—I observed in the *Times* of July 15th a notice of the employment of a mirror in the locomotive engines in the Austrian railways. Another letter in the same newspaper, of this date, claims the suggestion as having been made by the correspondent more than a year ago.

As the subject is one of some importance, I beg to refer your readers to No. 1338 of the *Mech. Mag.*, March 31, 1849, where they will find inserted a detailed proposal by myself for employing mirrors as above mentioned, with the mode of doing so explained by woodcuts.

I am, Sir, yours, &c.,
JOHN MACGREGOR.

Temple, July 17, 1852.

KIRKMAN'S MNEMONICAL LESSONS.*

The present work is a novelty in mathematical literature. The chief object of it is to supply the mathematical student with the means of recalling to his mind, when wanted, these various formulæ and results of elementary analysis that are in more especial request in algebraical investigations, and to bring them as it were to his fingers' ends through a new and more artificial, but readier channel.

Those who are acquainted with the valuable, though long neglected *Memoria Technica* of Dr. Grey, can in some degree anticipate the author's plan. What Dr. Grey attempted for history and chronology, Mr. Kirkman here attempts for mathematics. Both are, of course, innovations upon established routine, and therefore a candid estimate of the merits and efficiency of either can be expected only from the unprejudiced few. We would say, let Mr. Kirkman's mnemonic system be tried—let it be tested by the results of actual experience. Judging from his preface, the author is anxious that his book should be subjected to this ordeal, and is willing to abide by the issue; and, as he is a man of high mathematical repute, we conceive that he has a right to make the request.

It is very probable, however, that the practised analyst, in the absence of such experimental test, may be inclined to view Mr. Kirkman's mnemonic contrivances more as incumbrances than as aids; but students—mere *learners*—are the persons most competent to pronounce a right verdict upon their value; and it is for such persons that the present brief notice of the mnemonical lessons is introduced here.

But whatever opinions of Mr. Kirkman's mnemonic formulæ may be entertained by mathematicians, who can do without them, we think that all will agree that the author has, in addition to these formulæ, supplied a comprehensive and well-written syllabus of analytical trigonometry and analytical geometry. His investigations of the fundamental truths of these two important subjects are distinguished by great clearness, simplicity, and originality; and students of these departments of mathematics, who may even be indisposed towards the mnemonics, will find one-and-sixpence—the price of the book—well laid out upon the collateral matter: the last lesson or two may teach something even to proficients.

We shall merely add, in conclusion, that to the objection sometimes made to mnemonics in general, namely, that so far from *diminishing* the burden on the memory, they *increase* it, Mr. Kirkman replies, after the manner of Æsop, as follows:

"Once upon a time there was a handy man, who took a fancy to joinering. He went up the town, and bought a complete assortment of carpenter's tools—everything from a woodman's axe to a sprig-bit. As he was scratching his ear in meditation about the best way to convey them home, a simple bystander suggested—'Why don't

* "Mnemonical Lessons in Geometry, Algebra and Trigonometry. By the Rev. Thomas Penyngton Kirkman, M.A., Rector of Croft with Southworth." London: John Weale. 1852.

you look out for a wheelbarrow?' 'Because I am not an ass,' was the curt reply; then, softening a little, he added—'Do you see, my good friend, the difference is exactly here: as it is, I have my tools to carry home; if I took your advice, I should be saddled with both the tools and the wheelbarrow!'"

PHOTOGRAPHY.

A few days ago we obtained a personal proof of the utility of an invention made and registered by Mr. Beauford, of Hastings, which, by being applied to the usual daguerreotype instrument, materially increases its power and capabilities in a variety of ways.

The object-glass used on this occasion was one of Voigtlander's double achromatic daguerreotype lenses, with a diameter of 3½ inches. We took our seat about 6 feet from from this instrument, and our portrait was taken in 40 seconds, the operation in this case being unassisted by any additional apparatus. The next step was to apply one of Mr. Beauford's "accelerators" to the instrument, when a portrait was obtained in the space of 25 seconds, the instrument and ourself remaining unmoved. This accelerator was next removed and another substituted, when the time was shortened to 15 seconds. A third step was made, and the accelerator on this occasion did its work in less than 10 seconds. As the accelerator increased in power, the portraits diminished in size, but the life-like appearance of the portraits thus obtained was very striking, the picture appearing in high relief, devoid of the flat appearance observable in daguerreotype portraits taken in the usual way.

We may here remark that the portraits thus taken were obtained while the room was shaded with a thick cloth, or the time of operation would have been still further abbreviated. On a subsequent occasion the cloth was removed, and the result was that the photographs were obtained in one-third the time required on the previous occasion; for instance, a portrait which required 15 seconds on the previous day, only took five seconds on this, so that a portrait which occupied 10 seconds before, now only required about three seconds.

Thus from the same instrument, without any change of position beyond a little screwing of the moveable parts of the camera, we had four different portraits taken, varying from a considerable size down to a much smaller one. Had not the accelerator been employed, a change of instrument must have taken place, or else a change of position, which latter process would have required more space than most studios would permit, to say nothing of other inconveniences.

From our own observations we can state of Mr. Beauford's invention that it is eminently qualified to cheapen and facilitate photographic operations. Instead of having four costly instruments of various sizes, the operator need have but one large one, as by employing different accelerators (which are very much cheaper than an entire instrument) he can obtain portraits of any degree of diminution. He also avoids all trouble of moving his apparatus about to catch the required foci for portraits of different magnitudes. He will likewise find the accelerator so to intensify the solar influence, that by its aid he will be able to take portraits in dull weather which would defeat his best efforts with the ordinary instrument.

Photographers will understand us when we tell them that no diaphragms are employed in this process. Respecting these appliances we could call the attention of artists to the fact that a diaphragm diminishes the amount of solar radiation which enters the camera, and therefore weakens the power; whereas the accelerator, while it diminishes the size of the portrait, increases the strength of the actinic influence, and abbreviates the time of the operation while it improves the result.

It has long been an objection to photographic portraits that they are distorted, the central and forward parts being disproportionately large. This is generally observable in the case of the hands, which appear of a size not very agreeable to any one of the gentler sex who may have been the sitter on the occasion. By employing Mr. Beauford's accelerator this is entirely obviated, and the representation is in all respects a faithful one.

In the ordinary process, when an operator requires a smaller portrait he has to draw his instrument further back, in doing which he loses power, his lenses receiving a lesser amount of radiation from the object. By using the accelerator, he is enabled to maintain his former position, and hence avoids a loss of power. As we have said before, no distortion arises from this process.

This invention was exhibited in the Great Exhibition, being at that time provisionally registered. Plans and a description were forwarded, by request, to the American government at Washington. The general adoption of this useful invention seems inevitable, and we hope that the ingenious in-

venter, being now protected by a regular registration, will meet his due reward.—*Hastings and St. Leonard's News, July* 16.

PRINTING IN GOLD.

Dibdin, in his "Decameron," (vol. ii., p. 416), states, that "This country has also an honour and a treasure to boast of in Mr. Whittaker's 'Magna Charta,' printed in letters of gold, with illuminations. His manner of operating is yet a secret. The Society for the Encouragement of Arts offered Mr. Whittaker a premium for his ingenuity, upon the condition, as is usual, of his making the process known; but Mr. Whittaker, aware of the importance of keeping it secret, declined the premium. There are some copies on vellum—beautiful, splendid, and characteristic, beyond any similar work (I had almost said ancient as well as modern) which it has ever been my good fortune to behold. Indeed, taking it 'all in all,' those who have not seen such an union of typographical and graphical skill as those illuminated copies display, can have no idea of the extraordinary felicity of their execution."

The method adopted by Mr. Whittaker is the following, for which the Jury is indebted to Mr. John Harris, who was employed on the work. The page is composed in moveable type, in the usual way; a stereotype plate is taken. A piece of iron of the size of the page, about half an inch in thickness, is made hot, and placed on the table of an ordinary typographical printing-press; the stereotype plate is then placed on the iron plate, and gets hot, and leaf-gold of an extra thickness, of the size of the plate, is laid very carefully on the surface of the plate; then the paper or vellum is placed on the tympan in the usual way, having been previously sifted over with dried glaire of egg and rosin finely pulverized, which adheres to it in sufficient quantity; the tympan is then turned down, and the pull dwelt on. The degree of heat must be ascertained by practice: if the plate be too hot, the gold is dead and drossy; if too cold, then it appears bright but imperfect. This process is similar to that now used by bookbinders in block-gilding with an arming press.

About twenty years ago, M. Sturtz introduced into England printing in gold from copper plates. His process was, to mix with printers' ink weak burnt oil, a certain quantity of gold or silver bronze, to the same consistency as that of strong copper-plate ink, and filling the plate with it, to dab it in with the fingers. The plate had to be engraved deeper than usual, and when filled, it was delicately cleaned off first with a rag dipped in a weak solution of pearlash, and then with the palm of the hand, in the usual way. It was afterwards submitted to a heavy impression of the copper-plate press, being printed in the manner called "thorough press," and the impression, when dry, polished by passing it through the press several times with the printed face against a highly-polished steel plate, by which a beautiful brightness was imparted to the bronze. This process, decidedly the best where great perfection is required, has been abandoned by most of the copper-plate printers for the cheap and less tedious one of first printing with a coloured-ink ground with gold-size and oil, and then rubbing the bronze on the paper when just printed.

Printing in gold by letter-press soon followed the method of copper-plate gold printing. Messrs. Vizetelly and Branston were the first to apply it; and their visiting and address cards, printed by letter-press, from rose-engine plates, have never been surpassed for the brightness and beauty of their execution.

About the same period, Mr. De La Rue, in conjunction with the late Mr. Balne, of Gracechurch-street, produced a large royal-8vo edition of the New Testament, printed in gold, twenty-five copies of which were in pure gold powder. Nothing has since been produced equal to this unique edition. At the coronation of Queen Victoria, Mr. De La Rue undertook to produce the *Sun* newspaper printed in gold. The rapidity with which this had to be effected, was one of the many difficulties he had to encounter. Messrs. Clowes and Sons afforded him every aid by placing at his disposal the printing machines of their extensive establishment. Upwards of one hundred persons were employed to rub the bronze on the printed sheets, which had to be brought from the printing-office in Stamford-street as soon as printed, to Messrs. De La Rue's works in Bunhill-row, to be there bronzed and finished. More than 100,000 copies were thus produced—10,000 in time for the publication of the *Sun* on Coronation day.

Gold printing is now applied to numerous purposes in most countries. The following is the best method of producing good and bright results by letter-press printing:—Take the best printers'-varnish, grind it to a thick consistency with the best sienna or brown umber, and reduce this with De La Rue's gold-size until it be of the thickness of thin treacle; ink the form in the usual manner, and when printed, apply the bronze by rubbing it gently over the article with cotton wool. If leaf gold or leaf metal is required, it must be laid on carefully; and then the dry sheets should be wiped, to clear them of the superfluous bronze or metal. The gold printing is much improved

by its being passed over polished steel plates between powerful rollers.—*Report of Jury, Class XVII., Great Exhibition.*

CENTRIFUGAL PUMPS.

In these pumps, water admitted at the axis of a hollow wheel, traversed by vanes, and made to revolve rapidly, is expelled at its circumference.

The pipe by which the water reaches the axis of the wheel (or the reservoir which feeds it) becomes, under these circumstances, a suction pipe; and if the reservoir into which the water is received from the periphery of the wheel be closed, and a pipe be carried from it upwards, the latter becomes a force-pipe.

The greatest economy of power in such a pump may be expected to be attained when there is the least possible loss of the *vis viva* of the water in its access to the wheel, and when there remains the least possible *vis viva* in it when it leaves it. For if there be any loss of the *vis viva* of the water in its ingress to the pump which might have been avoided, it is evident that power must have been expended unnecessarily in producing that *vis viva*. And, in like manner, if any *vis viva* remain unnecessarily in the water when it leaves the wheel, it is evident that the power by which that *vis viva* was created might have been saved.

The expedients by which the water may be brought to the wheel with the least loss of *vis viva* are common to this and to other hydraulic machines; those by which it enters and is delivered *from* the wheel, are peculiar to the centrifugal pump.

If the vanes be straight, it is evident that whatever may be the velocity of the water in the direction of a radius, when it leaves the wheel, its velocity in the direction of a tangent will be that of the circumference of the wheel; so that the greater the velocity of the wheel, the greater will be the amount of *vis viva* remaining in the water when discharged, and the greater the amount of power uselessly expended to create that *vis viva*.

If, however, the vanes be curved backwards, as regards the motion of the wheel, so as to have nearly the direction of a tangent to the circumference of the wheel at the points where they intersect it, then the velocity due to the centrifugal force of the water carrying it over the surface of the vane in the opposite direction to that in which the wheel is moving, and nearly in the direction of a tangent to the circumference, will—if this velocity of the water over the vane in the one direction be equal to that in which the vane is itself moving in the other—produce a state of absolute rest in the water, and entire exhaustion of *vis viva*. And in whatever degree the equality of these two motions—of the water in one direction over the vane, and of the vane itself in the opposite direction—is attained in that same degree will the water be delivered in a state approaching to one of rest. The expedient of curved vanes is adopted in Mr. Appold's pump.

With regard to the admission of water to the wheel, it is obvious that it should pass direct from the suction-pipe into the wheel without the intervention of any reservoir, in which the *vis viva* of the influent stream, communicated in the act of rising through the pipe may expend itself, and that such space should be allowed at the centre as not to alter the dimensions of the influent stream. It would further seem expedient, by means of properly-constructed channels to divide the water into separate streams and to give to these divergent streams such curvatures as would facilitate their entrance upon the channels formed by the vanes; as in the turbine.

It is obvious that the tendency of the centrifugal force continually to increase the velocity of the water *over the vanes* as it recedes from the centre cannot take effect in respect to all the particles of water in the same section, unless the sections of the channels diminish. If they do not, some of the particles of water in each section must be continually retarded and power be uselessly expended in producing this retardation; whilst the current cannot but suffer from it a disturbance destructive of its *viva*.

This diminution of the sections of the channels might probably best be effected by giving to the sides of the wheel the forms of conical discs; an expedient which is adopted in Mr. Lloyd's blowing machines, and in Mr. Bessemer's centrifugal pump.

The communication of motion to the water of the reservoir in which the wheel revolves, and into which the water is discharged, should by every practicable expedient be avoided; and for this object the water should be kept as much as possible from the sides of the wheel. This is effected in Mr. Appold's pump by fixing the wheel between two cheeks, which project from opposite sides of the reservoir. The velocity with which the wheel must be driven depends upon the height to which the water is to be raised. Beyond a certain height, this velocity is practically unattainable. But long before this limit is reached, it becomes inconsistent with an economical application of the power which drives the pump. It is probably, therefore, only in comparatively small lifts, where a large quantity of water is to be discharged, that the centrifugal

pump will be found useful.—*Report of Jury* (Class V.), *Great Exhibition.*

KASHMIR SHAWLS.

From the limited nature of a report of this kind, a complete history of the shawl manufacture will not be looked for, however interesting it may be; but such is the importance of this beautiful fabric, and of its valuable trade, that a sketch of its origin, and of its rapid European development, may well precede our particular remarks upon its present position, and upon the examples now exhibited. The source from which this article has sprung is well known to be the ancient and beautiful fabric of the Valley of Kashmir, where the excellence of the raw material stands to this day unequalled, although its manufacture has been and is still carefully prosecuted in many parts of the world. The great beauty of the eastern tissue, considering the rudeness of the means of machinery employed, as compared with those which are now available to the European manufacturer, is a marvel in the eyes of the most experienced.

The superiority of the woollen fabrics of Kashmir is to be found recorded in many ancient eastern works. In the Mahábhárath, where narrating the transactions taking place at the palace of Gundeshthira, the eldest of the Panda princes, about the period of two hundred years before Christ, it is stated,* "that the people of Kaneboja (the northern districts surrounding Kashmir) brought cloths and skins as tribute." The former were made of wool, and embroidered with gold—being, in fact, shawls and brocades.

Again, in the Ayeen Akbery,† being the institutes of the Emperor Jilaleddeen Mohammed Akbur, sixth in descent from Timur (Tamerlane the Great), proclaimed emperor in 1556, we find the following interesting account of shawls:

"His Majesty has ordered four kinds of shawls to be made:—1st. Toos affee (grey affee), which is the wool of an animal of this name, whose natural colour, in general, is grey, inclining to red, though some are perfectly white; and these shawls are incomparable for lightness, warmth, and softness. Formerly they were made of the wool in its natural state, but his Majesty has had some of them dyed, and it is surprising that they will not take a red colour. 2nd. Sufed alcheh (white alcha), which they also call terehdar. The natural colours of the wool are white or black, and they weave three sorts, white, black, and grey. Formerly, there were not above three or four different colours for shawls, but his Majesty has made them of various hues. 3rd. Zerdozy, and others,* which are of his Majesty's inventions. 4th. From being short pieces, he had them made long enough for jamehs (gown pieces.) The shawls are classed according to the day, month, year, price, colour, and weight; and this manner of classing is called missel. The mushrifs, after examination, mark the quality of each upon paper affixed to its corner. All those brought into the palace on the day Ormuzd, of the month Ferirdine (10th March), are preferred to those received afterwards, of the same fineness, weight, and colour, and each is written down in order. Every day there are received into store the following kinds,† and from this account of one day may be formed an idea of what is done in the course of a year.

"Formerly, shawls were but rarely brought from Kashmir, and those who had, used to wear them over the shoulders in four folds (*vide* ancient Scriptures), so that they lasted for a long time. His Majesty has introduced the custom of wearing two shawls, one under the other, which is a considerable addition to their beauty. By the attention of his Majesty, the manufacture in Kashmir is in a very flourishing state; and in Lahore there are upwards of a thousand manufactories of this commodity. They also make an imitation of shawl with the warp of silk and the woof of wool, and this kinds is called 'mayan.' Of both kinds are made turbans, &c."

With this account before us, it is reasonable to suppose that varieties of every kind were introduced about this period; and the evident encouragement given to these improvements, doubtless, tended much to the progress of this trade, while these shawls continued to be a favourite article of dress, during the Mahommedan dynasties in particular. After their decline, it is probable that the troubled state of Upper India, and the general turbulence of the mountain character, had its effect in retarding the progress of a trade involving the labour of so many hands; but its absolute necessity as

* *Vide* vol. ii., p. 140. † *Vide* vol. i., p. 105.

* Zerdozee, gold-leaved; goolabtum, rose-body; kesheedeh, worked; kulgha, pine-shaped; bandhemiun, spotted; cheet, like chintz; alcheh (ignor); perzdar, with a nap.

† Toos, grey; sefed, white; lalsereen, red-golden; narenjee, orange; berenjy, rice-coloured; kahsy, straw-coloured; gulpumbeh, rose-cotton; sendely, sandal-wood; banamee, almond; arghnwanee, bright red; asaby, musk-perfumed; assely, pure; gulkasnee, cockscomb-colour; sileky, light; alifee, marked with alifs or sprigs; festoky, sea-green; pezhgul, a Turkish wood; goolkhear, spotted; nezybereen, spearhead; asmany, sky-colour; goolabee, rose; kulghy, pine-shaped; aby, watered; zytoony, olive-coloured; segevy, liver-coloured; zemroody, emerald; benefsa, violet; fakhtehy, ringdove colour.

an article of wearing apparel to every well-dressed native of India, Persia, and parts of Turkey, effectually prevented the manufacture from falling into decay, even at the worst of times. It was once said that there were upwards of 30,000 looms at work; but Strachey, who visited the country in 1809, gives 16,000 as the number at that time. The value of the whole produce was estimated at thirty-five lacs of rupees; but Moorcroft, who was there in 1822-23, says it has declined to half that sum. A renewed vigour has been instilled into it within the last thirty years by the constantly increasing demands of the European markets; and the present improved state of Government, of social rights and intercouse, in that part of India, will of course add greatly to the energies of a persevering and pains-taking people, and will most probably give early proofs that its resources have never been fully developed. The valley itself is now in the hands of Golab Singh, a chief who fully appreciates the value of the trade; but many of his measures are oppressive to the manufacturer, and some of the best makers are finding it to their advantage to settle in the neighbouring cities, under the British Government, where they are able, in perfect freedom, to push their trade to any extent. Umritzer and Lahore are already showing rapid progress in this trade, and there is no reason why their production should not equal, in all respects, those of Kashmir; while the demand for Europe is entirely promoted by European agents residing there, for the express purpose of encouraging perfection in design, colour, and texture.

The activity of the present trade may be estimated from the following returns, procured from the firm of Ripley and Brown, the leading brokers in this trade:

		Imports.	Deliveries.	Exports.
In	1842	2,484	2,740	2,218
	1843	2,726	2,992	2,298
	1844	4,957	4,127	2,757
	1845	7,981	5,411	3,869
	1846	3,709	5,429	3,400
	1847*	3,989	4,354	3,045
	1848*	2,389	1,904	1,484
	1849	1,183	3,311	2,403
	1850	6,982	5,753	4,242
	1851†	4,034	2,898	2,139

We find publications in France, "sur la fabrication des châles," which give the date of about 1800 as the period of the first introduction into France of the taste for this article of dress, and of their first importation from Egypt, where undoubtedly they had found their way from the eastern emporium chiefly through Persia. In England, however, the fashion had been earlier introduced by those connected with the East India Company's trade, and they were included in the periodical sales of prohibited goods, held at the East India-house as early as 1750. In 1787, we find they were admitted by our Custom-house upon payment of an *ad valorem* duty of 27½ per cent., which duty has been thus changed by various Acts and regulations:

1812....	£81 2s. 11d. per cent.
1813......	62½ per cent.
1814......	67½ ,,
1825......	30 ,,
1842......	7½ ,,
1846......	5 ,,

The severe restrictions upon their importation, and their consequent costliness, induced the weavers of Norwich to make the first attempt at imitation of the Indian fabric; and we are informed that in 1784, Mr. Barrow, and Alderman Watson, of that town, succeeded in weaving the first Indian style of shawl, we believe, ever made in Europe. The process was too slow and unprofitable to induce them to continue their operations; but Mr. John Harvey, of the same town, followed up the enterprise with Piedmont silk warp and fine worsted shoot, the designs being worked in by a process of darning by hand. No great progress however appears to have been made in this tedious and expensive process, and not till 1805 was an entire shawl produced from the loom in Norwich. In Paisley and in Edinburgh they took up the manufacture about the same time, but the former town has alone retained it, making India imitations now of real Kashmir wool thread, at very low prices, to a large extent.

In 1802, a commencement was made in Paris; and it is related that the enormous expense of 60,000 francs, expended in setting the loom prepared for the purpose, induced the immortal Jacquard to invent his wonderful process of working intricate designs with facility. In 1819 great success had been reached upon looms *à la tire*, with Kashmir wool imported for the purpose, and spun with great skill in France. Not earlier, however, than 1834 was the present process, called spouliné, which is the exact imitation of the Kashmirean, so introduced for working intricate designs, that one man with the Jacquard loom can produce the excellence now attained in Paris. In fact, we find the true Indian shawl there produced, but perfected by the addition of machinery, and sold at about a quarter of the cost in India, their range of prices being, for squares of full size, 25 to 600 francs

* Troubles in Europe and in India.
† Up to May.

and for long shawls of full size, 50 to 1,500 francs: 4,000,000 francs is given as about the value of the total production of these fabrics in France at the present time; that of Scotland cannot so easily be estimated, but it is very large, though the shawls are chiefly of a cheaper description, ranging from 7*s.* 6*d.* to 5*l.* per square, and 1*l.* to 15*l.* for long shawls. We have dwelt thus at length upon the productions of France and England, because of the greater development of the manufactures in these countries where it had been first introduced; but we find that within the last five years Austria, the States of the Zollverein, and Belgium, have been setting their looms upon similar produce; and with such excellent material at command, and such ingenious and industrious artizans, they may soon vie—in cheapness, at any rate—with either of their predecessors in the trade. There is a peculiarity in the character of a real Kashmir shawl, as well as in originality of design as in solidity and durability, which, notwithstanding the enormous difference of cost, will retain its value in the eyes of those who can afford to pay it. The finer descriptions cannot be purchased in the valley under 300 to 1,500 rupees for square, and 450 to 2,000 rupees for long.—*Report of Jury, Class XV., Great Exhibition.*

PORTER'S PATENT ANCHORS.

PRIVY COUNCIL, Monday, July 19.

(*Before Lord Justice* CRANWORTH, *Lord Justice* KNIGHT BRUCE, *Dr.* LUSHINGTON, *and Sir* EDWARD RYAN.)

This was an application on the part of Mr. Honiball, the assignee of Porter's patent anchor, for an extension of the term of his patent, which was granted in 1838.

Sir Alexander Cockburn and Mr. Webster appeared for Mr. Honiball, and the Attorney-General on behalf of the Crown.

Several witnesses were examined to prove the superiority of this anchor as improved by Mr. Trotman, a nephew of Mr. Honiball, and who offered no opposition, over ordinary anchors. The peculiarity consisted in its strength as compared with its weight, the tenacity with which it held in the ground, the facility with which it came into its position, its non-liability to become fouled, and its convenience in stowage and transport. It is used in upwards of 150 men-of-war, and by several of the large steam companies. It appeared that hitherto there had been a loss of about 15,000*l.* in working the patent.

The ATTORNEY-GENERAL tendered no opposition, and

Their LORDSHIPS granted an extension for six years.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JULY 22, 1852.

WILLIAM COOK, of Kingston-upon-Hull, working coppersmith. *For certain improvements in the construction of steam engines, consisting of a rotatory circular valve for the regular admission of steam from the boiler alternately into the chambers of the two cylinders of double acting engines.* Patent dated January 12th, 1852.

The nature of this invention will be readily seen from the title of the patent. The valve occupies a position between the two cylinders of the engine, and is driven by gearing from the engine crank shaft. The claim is for a rotatory valve divided and arranged as described.

JEANE ANTOINE FARINA, of Paris. *For a process for manufacturing paper.* Patent dated January 13, 1852.

This invention consists in obtaining pulp for the manufacturer of paper from the plant called "spartum," or "water-broom."

The patentee takes the plants, and having separated the roots from the stems, he cuts the latter into pieces of from four to six inches long, which pieces he submits to the operation of barking or stripping. He then steeps them in water rendered alkaline wite American or other potash, in the proportion of about 2 per cent. of the weight of stems operated on, and continues the steeping about four hours, during which time the temperature of the solution is raised by steam. As soon as the steeping is completed, and the material is cold, it is removed to a crushing mill, and is then washed in water acidulated with nitric or sulphuric or muriatic acid, after which it is corded, bleached (by liquid chlorine or the vapour evolved from chloride of lime, wetted with muriatic acid,) and again washed, when it is in a fit state to be used alone or mixed with cotton or linen pulp, according to the processes ordinarily followed in the manufacture of paper.

The roots of the plant may be treated in a similar way, only as they are much harder than the stems, a greater quantity of potash will be required in the steeping process and of acid in the subsequent washing; and the bleaching process will also occupy a longer time. It is to be observed, however, that the pulp produced from the roots will not in any case be so white as that from the stems.

Claims.—1. The preparation of pulp from the plant called "spartum," or "water-broom," for the manufacture of paper, by means of the operations described.

2. The employment of American or other potash in the preparation of pulp from "spartum."

3. The employment of nitric acid in the preparation of pulp from "spartum."

JAMES MACNEE, of Glasgow. *For improvements in the manufacture or production of ornamental fabrics.* Patent dated January 20, 1852.

These improvements have relation to ornamental fabrics of the "zebra" class, which are usually produced by the employment of coloured warps, and an intricate system of weaving, involving the necessity of using a jacquard in conjunction with the loom. The patentee proposes, however, to weave such fabrics with uncoloured warps, thus obtaining a perfectly plain fabric on which the zebra pattern is subsequently produced by any of the ordinary processes of printing: and in order to give to such fabrics a greater resemblance to those on which the pattern is produced in the weaving, the patentee causes certain parts of the back or reverse side of the plain fabric intended to be subsequently printed, to be flushed or back-lashed, thus giving it the appearance of having been woven according to method usually adopted of manufacturing such descriptions of goods by the employment of a jacquard apparatus.

Claims.—1. The manufacture of a new fabric of the zebra class, or nearly resembling zebras.

2. The process or mode of producing such fabrics.

3. The manufacture or production of a plain or unfigured fabric with a flushed reverse side for the purpose described.

PETER WRIGHT, of Dudley, vice and anvil manufacturer. *For improvements in the manufacture of anvils.* Patent dated January 20, 1852.

These improvements consist in manufacturing anvils by compressing the metal of which they are to be formed in a die, or dies instead of making them by welding together several pieces of metal, which is the method usually adopted.

When the anvils are of large size, the patentee makes them in two or more parts, which having been brought by compression in a die to the required form, are then welded together to produce the finished anvil. When, however, they are of small dimensions, they may be made from a single mass of metal, which having been first hammered to something near its ultimate intended shape, is compressed into a die by heavy blows from a hammer, and the manufacture is then completed in the usual way.

The patentee does not limit himself to any particular number of pieces of metal in manufacturing anvils according to his method, but claims,

The mode described of manufacturing anvils, by which they can be made in one or two pieces by forcibly compressing the metal of which they are composed in a die or dies.

THOMAS KENNEDY, of Kilmarnock, gunmaker. *For improvements in measuring and registering the flow of water and other fluid.* Patent dated January 20, 1852.

Mr. Kennedy describes and claims several arrangements of meters for water and other fluids, which are all distinguished by one prevailing feature of construction, which consists in so connecting an adjustable valve or water-way, with an arrangement of clock-work or other uniform continual mover, that the quicker or slower rate of flow, or the greater or less supply of water passing through the water-way, shall be at all times indicated by variable apparatus worked from the continual mover, or rather actuated by the combined motion of the continual mover and the variable portion of the adjustable valve itself.

GEORGE LOWE, of Finsbury-circus, civil engineer, and FREDERICK JOHN EVANS, of Horseferry-road, Westminster, civil engineer. *For improvements in the manufacture of gas for the purposes of illumination, and of improvements in the purification of gas*, and of improved modes of treating the products arising from the manufacture of gas. Patent dated January 20, 1852.

The words of the title printed in Roman characters have been disclaimed by the patentees.

The *first* part of the invention consists in increasing the illuminating power of certain gases by combining them with carburetted hydrogen in the retorts in which the same is generated. The carburetted hydrogen is produced from cannel coal, coal, lignite, pitch, tar, oil, resin, retinite, and other substances, which are distilled in suitable retorts, into which the gases whose illuminating power is to be increased are introduced whilst these matters are undergoing the process of distillation. The gases to be treated in this manner may be obtained from wood, sawdust, dried tanners'-bark, or other similar materials. The gases from inferior qualities of coal, and from peat, will also be suitable for being similarly treated, as also carbonic oxide gas. This latter may be obtained by passing carbonic acid through a retort containing coke at a white or red heat. The waste gases from furnaces may also be combined with carburetted hydrogen, either after having been passed through retorts containing coke at a red or white heat, or directly on issuing from the furnace.

The *second* part of the invention, which

has relation to the purification of gas from sulphuretted hydrogen, consists in the use for that purpose of a certain material hitherto supposed by chemists to be a ferrate of potash, but which is, in reality, peroxide of iron in a peculiar state; and also of sulphite or bisulphite of lead.

The method of preparing the first-mentioned material is as follows;—the patentees takes any kind of peroxide of iron and calcine it with caustic potash or soda. The compound thus produced is then decomposed by diffusing it in water, when the caustic soda or potash used is separated, and remains in solution, from which it may be recovered, and the peroxide of iron is precipitated in a fit state for use. Or they mix with peroxide of iron and caustic soda a small portion of common salt, and proceed as before. Or they heat the common peroxide of iron to a temperature of about 600° Fahr., and thus render it capable of purifying gas, though previously inert. Or they treat in the same way such ochres or ferruginous earths as will, after calcination, become black on being submitted to a stream of sulphuretted hydrogen. The prepared peroxide of iron may be mixed with sawdust, slightly moistened, and used in the same way as lime in what is known as the dry-lime purification process. Or it may be diffused through water, and used as in the wet-lime process. In the former case, the material may be revivified by exposing it to the a r. In the latter in can also be recovered for repeated use, by separating it by filtration, drying, and then exposing it to the air.

The sulphite or bisulphite of lead is used in the manner practised in lime purification. By calcining the spent materials, sulphurous acid may be obtained which can be employed in producing fresh sulphite or bisulphite, or converted to sulphuric acid, while the residue, after calcination, by careful roasting, may be converted to litharge.

Claims. — 1. The combining of gases which possess different degrees of illuminating power by the introduction of gas obtained in any of the ways described, into retorts, or vessels, containing carbonaceous matter under distillation.

2. The use of anhydrous peroxide of iron, also of sulphite and bisulphite of lead for the removal of sulphuretted hydrogen from coal gas.

Henry Graham William Wagstaff, of Bethnal-green, candle-maker. *For improvements in the manufacture of candles.* Patent dated January 20, 1852.

Mr. Wagstaff's improvements are as follows:—

1. In addition to the matters with which candlewicks are usually saturated to assist their combustion, he applies a small quantity of gelatinous material to give stiffness to the wick, and then passes the same between heated rollers, by which the wick is dried and brought to a proper shape for use.

2. He takes two, three, or four plaited wicks, and having passed them in a state of tension into a vessel containing melted wax or fatty materials, he brings them into contact, and withdraws them from the vessel through a narrow aperture in the side of the vessel, and then through a refrigerator, by which means the wicks are cooled and caused to adhere to each other, but, when burning, are enabled to separate sufficiently to turn out of the flame of the candle in which they have been used.

3. He winds the wicks for dip candles on a reel of peculiar construction, which he sets in revolution over a vessel containing melted fatty matters, and, by causing the lower part of the reel to dip in the fatty matters, all the wicks upon it are coated at a single revolution. They are then strung on rods, and dipped in the usual way.

4. For moulding candles having two or more wicks, he uses an arrangement of mould frame in which the moulds are set in continuous rows in an inclined position, the same wicks passing through all the moulds in a row. The wicks are sustained in their positions in the moulds by being passed over weighted rocking flaps, situated in the spaces between the ends of the rows of moulds.

Claims.—1. The modes of treating or preparing plaited candlewicks, and also the apparatus described for carrying out such modes of treatment.

2. The mode of manufacturing candles having two or more wicks, and the means of sustaining the wicks in the candle-moulds or mould-pipes.

Peter Armand Lecomte de Fontaine-moreau, of South-street, Finsbury. *For certain improvements in treating fibrous substances.* (A communication.) Patent dated January 20, 1852.

Claims.—1. A mode of desiccating silk and other fibrous substances, to discover and determine their exact and absolute weight, by means of an apparatus described.

2. A process of discovering the presence of foreign matters when they exist in silk; and also of ascertaining the loss of weight by the process of "boiling off."

WEEKLY LIST OF NEW ENGLISH PATENTS.

John Hunt, of Rennes, France, gentleman, for certain machinery for washing and separating ores. July 16; six months.

William Fawcett, of Kidderminster, Worcester, for certain improvements in the manufacture of

carpets. This patent being opposed at the Great Seal, was not sealed till 17th inst., but bears date the 2nd February last, by order of the Lord Chancellor.

Joseph William Schlesinger, of Brixton, Surrey, gentleman, for improvements in fire-arms, in cartridges, and in the manufacture of powder. (Being partly a communication.) July 20; six months.

Julius Friedrich Phillipp Ludwig Von Sparre, of Brewer-street, Golden-square, mining engineer, for improvements in separating substances of different specific gravities, and in the machinery and apparatus employed therein. July 20; six months.

Stribblehill Norwood May, of Fitzroy-square, gentleman, for certain improvements in the manufacture of thread, yarn, and various textile fabrics from certain fibrous matters. July 20; six months.

Emery Rider, of Bradford, Wilts, manufacturer, for improvements in the manufacture or treatment of India rubber and gutta percha, and in the application thereof. July 20; six months.

John Shaw, of Dukinfield, Chester, cylinder-maker, for certain improvements in machinery or apparatus for carding cotton, wool, flax, and other fibrous materials. July 20; six months.

Sir William Burnett, Knight Companion of the most Honourable Order of the Bath, of Somerset-house, Middlesex, an extension for the term of seven years from the 26th day of July, 1852, being the expiration of the original grant of his patent for improvements in preserving wood and other vegetable matters from decay. July 20.

John Francis Egan, of Covent-garden, for improvements in the manufacture of sugar. (Being a communication.) July 20; six months.

James M'Henry, of Liverpool, merchant, for certain improvements in machinery for manufacturing bricks and tiles. (Being a communication.) July 20; six months.

Richard Bealey, of Radcliffe, Lancaster, bleacher, for certain improvements in apparatus used in bleaching. July 20; six months.

George Augustus Huddart, of Brynkir, Caenarvon, Esq., for improvements in the manufacture of cigars. July 20; six months.

Richard Birckton and Thomas Lawson, both of Leeds, York, manufacturers, for certain improvements in the adaptation and application of a new manufactured material to certain articles of dress. July 21; six months.

John Kirkham, of the New road, Middlesex, civil engineer, and Thomas Nesham Kirkham, of Fulham, civil engineer, for improvements in the manufacture of gas for lighting and heating. July 22; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
July 15	3333	W. Starkes	Lostock, Cheshire	Apparatus for cutting corn and other standing crops.
17	3334	M. Macpherson	St. Petersburgh	Annular boiler.
,,	3335	G. H. and D. Nicholl	Dundee	Kitchen range.
,,	3336	T. A. Readwin	Winchester-buildings	Revolving holder for pen, pencil, or toothpick.
20	3337	H. Barber	Leicester	Thread-carrier stop of a stocking frame.
,,	3338	Moran and Quin	Myddelton-street, Clerkenwell	Folded-spring catch.
,,	3339	W. Bown	Leicester	Apparatus for pluffing, fluting, and preserving the shape of gloves.
22	3340	W. Wigfall and Co.	Sheffield	Saucepan cleaner.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

July 15	443	J. Sutton	Newington, Surrey	Adjustible garden-pot and flower support.
,,	444	T. E. Moore	Poland-street, Oxford-street	Machine for lasting upper-leathers.
,,	445	T. Jones	Greenfield-street	Reversible-fronted shirt.
16	446	T. Bently and Sons	Liverpool	Centrefire pistol.
19	447	J. Bevan	Deptford	Round corner.
,,	448	W. Wray and Son	Leeming, near Bedale	Reaping machine.

Errata.

Page 45, col. 2, line 1, *for* "efforts," *read* "effects." Page 46, col. 1, line 4, *for* "coming," *read* "caning."

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Joseph Clinton Robertson, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1512.] SATURDAY, JULY 31, 1852. [Price 3*d*., Stamped 4*d*.

Edited by J. C. Robertson, 166, Fleet-street.

ARCHIBALD'S PATENT BRICK AND STONE-CUTTING MACHINERY.

Fig. 2*a*.

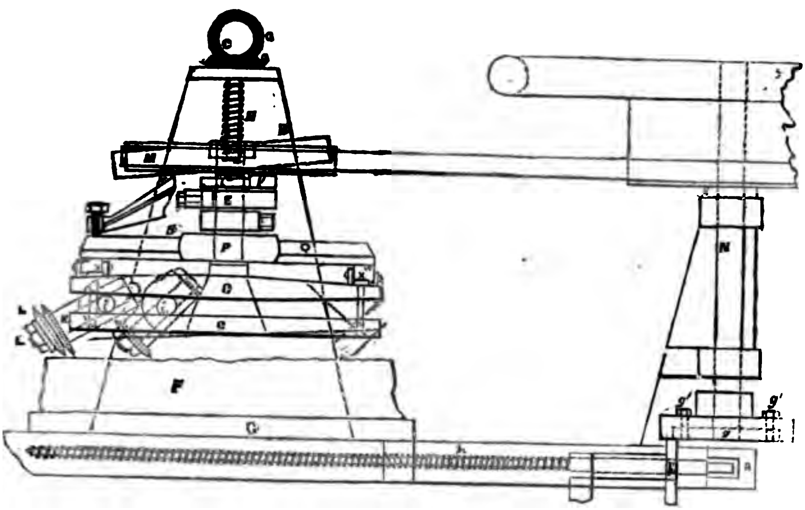
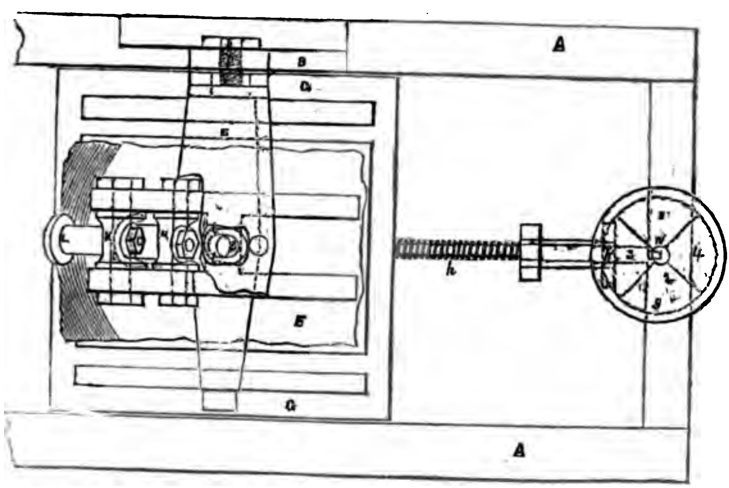


Fig. 3*a*.



ARCHIBALD'S PATENT BRICK AND STONE-CUTTING MACHINERY.

We continue our extracts from Mr. Archibald's Specification this week with a description of the machinery for cutting and shaping articles made of plastic materials, as also stone, wood, and metals.

Fig. 1 is an end view of a complete apparatus for the said purpose; fig. 2^a, a side view with one of the side frames left out; fig. 3^a, a plan of the principal parts of fig. 2^a, on a line immediately below the pulley M; and fig. 5^a, a separate view of the feed gearing portion of the apparatus. A A A A, are sills or stationary framing, upon which the slide carriage, or moveable bed, G G, works, which carries the stone or other materials to be operated upon forward to the cutters. B B are side frames, which are firmly fixed to the outside sills of the framing A A. E E is a cross head or frame, supported at each end by the side frames B B, which cross head carries an upright shaft *e*, in which the cutter heads, or holders K, and cutters L are fixed, or mounted. The cross head E E, is moved up and down in open slots *p p*, in the side frames B B, by means of the screws H H, and bevelled wheels *a a a a*, and shaft *k*, and thereby the cutters are raised or lowered as may be required to suit the different thicknesses of stone or work to be done. When the cutters are of their proper height the cross-head E E, and side frames B B are firmly held together by tightening up the screw bolts *b b*, which screw into the ends of the cross-head E E, through the open slots *p p*, in the side frames B B. When it is required to change the angle or pitch of the cutters, or to replace them by others, such as the quoit-cutters L L, shown in fig. 2^a, the holding screws *i i*, which screw into each side or end of the cutter holder K, through the side slots i^1 i^1, in the open jaws of the head stock C C, are slacked, which leaves the cutter holder K free to be turned, so that the cutters can be set at any required pitch or angle best calculated for attacking or cutting stone, or other material in its different stages of finishing, and then by giving a turn to the screw, or holding bolts *i i*, they hold the cutter holder firmly in that position. The shaft or spindle, L^1, to which the cutters L are firmly attached, passes through the centre of the holder K, and is left free to rotate or turn on its bearing, so that the cutters have a rotary motion upon their axis when passing over or cutting the stone. It is not necessary to remove the cutter holder K from the open jaws, when the cutter L requires changing or replacing, as the cutters can be removed at once from the ends of the shaft L, on which they are held by lock nuts, or by any other convenient means. To prevent accident from the cutter heads being thrown out of their place by centrifugal force, in case of the holding screws working loose, drop bolts *x x* are passed down through the jaws of the rotary head stock in front of the holding screws *i i*. The rotary head stock, or open jaws C C, vertical shaft *e*, and rocking shaft D, are connected to the moving cross-head E E, in bearings at each end of the rocking shaft D, in such a manner as to allow the vertical shaft *e*, rotary head stock C C, and rocking shaft D, to have a rocking or tumbling motion, and at the same time the stock-head C C, which carries the cutter holders K, and cutters L, a free rotary motion. For example, the shaft *e*, and head stock C C, may move round, say one-third of a revolution, when the shaft *e* is in a perfectly upright or vertical position, and when the cutters L are passing over and cutting the stone or other material F, parallel to its surface; but when the cutters have passed off, or over the substances F, then it becomes necessary that the cutters L should rise sufficiently high to clear and pass over the uncut part, or back part without touching the same. Now that object is accomplished, as follows:—The rocking shaft D, carries the vertical shaft *e* in a centre, bearing in the rocking shaft D, and up through a bearing with one-half movable in the cross-head E E, then upon the shaft *e* there is placed a cam *l*, and when the long, or throw side of the cam *l* comes in contact with the roller l^1, attached to the top of the cross-head E E, the shaft *e* is thrown out of a vertical or upright position during the time of that part of the revolution of the rotary head stock, or open jaws C C, which carry the cutters L L, on passing over the uncut or back part of the stone F, (see figs. 2^a and 3^a); as soon as the cutters have passed over, or by the uncut part of the stone, the throw or long side of the cam *l* passes by the roller l^1, and then the vertical shaft *e* is free to be brought into a vertical or upright position, which it

retains during that part of the revolution whilst the cutters are passing over and cutting the stone F, parallel to its surface.

Fig. 1a

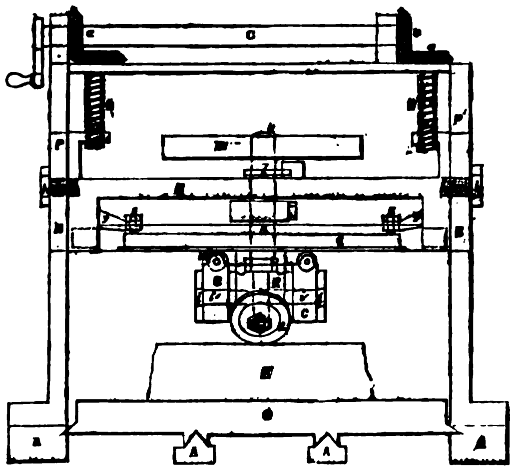


Fig. 7a.

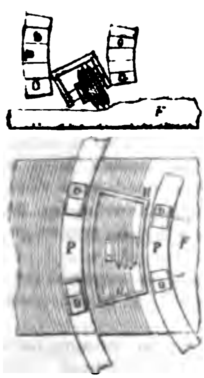


Fig. 5a.

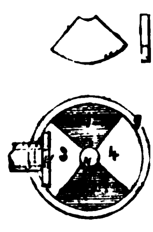
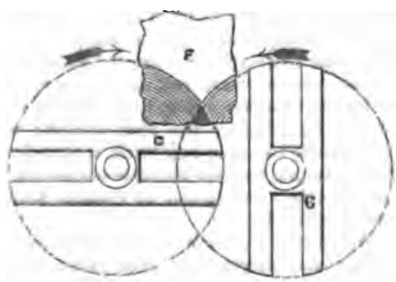


Fig. 6a.



Thus it will be seen that the quoit-shaped cutters L L, can attack the edges or corners of the stone at nearly the same angle as the hand workmen do with their chisels. The tumbling or rocking motion can be effected in several ways, but the plan before described is considered, on the whole, the most effective and economical. It is found to be important in practice, that the shaft *e*, should always be very firm and steady, whether rotating in a rocking or vertical position, and to make sure of this there is attached to the under side of the rocking or tumble shaft D, an apron or table Q, which rocks along with the shaft D; when the shaft *e* is in a vertical or cutting position, the apron comes in contact with stationary arms *y y*, attached to the frame E E, and regulated by screws Z Z. Friction rollers *w w*, are fixed on the upper side and ends of the jaws of the head-stock C C, so that they touch the underside of the apron; and when the cutters come in contact with the stone, the upward

strain is resisted by the apron and arms, whereby the shaft *e* is greatly relieved, and a firm steady rotary motion secured, either with the tumbling movement or otherwise.

Fig. 3*a* represents the manner in which the quoit-cutters L L pass over and cut the stone when working as above described; namely, with the rocking or tumbling motion, and throwing the chips within the circle, or towards the centre of motion. When stones are to be cut without regard to the corners or arris, it is proposed to work the machine without the rocking or tumbling motion, and pitching the cutters at the opposite angle, and use one or more sets of cutters in one or more sets of jaws. All that is required, in order to do without the rocking or tumbling motion, is to remove the cam *l*, or the friction roller l^1.

The engravings represent the shaft *e* as being turned by the belt *n*, from the driving pulley M, on the vertical shaft N, and as sliding on the pulley M, on vertical shaft *e*; but many other wellknown means may be adopted to effect the same object.

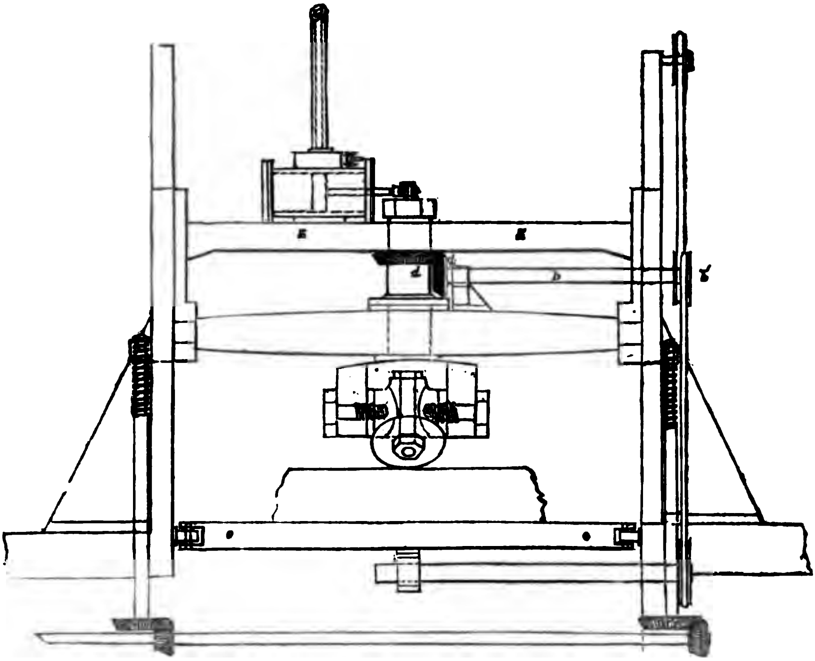
The inventor suggests that a steam cylinder might be fixed on the top of the frame E E, and the piston-rod attached directly to a crank on the upper end of the shaft, in which case the steam pipe would work up and down through a stuffing-box rising and falling, as circumstances might require. An arrangement of this sort is represented at fig. 8*a*. According to this plan, the feed motion would be communicated by means of the bevel-wheels *d d*, and shaft *b*, and pulley b^1. The sliding carriage, or bed G G, for moving or feeding the stone or other materials up to the cutters to be operated upon may be worked by any convenient mechanical means, and either by an intermittent or constant movement. The inventor employs for the purpose a screw-shaft *h*, turned or worked by a novel application of friction wheels or gearing: he mounts this screw shaft *h*, figs. 2*a* and 3*a*, on the stationary framing A A A A, and connected to the under side of the moving bed G G. To one end of the shaft *h*, he attaches a friction-wheel h^1, and to the lower end of the upright-shaft N; another friction wheel, or disc *g*, with movable segments, as best seen in detail in fig. 5*a*, which represents the under side disc-wheel *g* (also shown in figs. 2*a* and 3*a*.) The coloured sections 1 and 2, fig. 5*a*, being supposed to be removed, when the wheel h^1 is in contact with the wheel or disc *g*, the friction will give motion to the feed-shaft *h*, and the rotary motion to the feed-shaft *h* will be regulated just in proportion as the wheel h^1 is moved towards, or from the centre of the disc-wheel *g*, when it is required to make one pitch forward of the sliding carriage G G; that is, when the cutters are not in contact with the stone, then one or more of the segments (as the case may require), are removed in order to regulate the amount of the hitch or forward motion, or, in other words, the number of turns, or parts of turns necessary to be given to the feed-shaft *h*; when cutters are used in opposite jaws, it is requisite to make two hitch moves for every revolution of the head-stock G G. For example, the two opposite segments, 1 and 2, are removed, as shown at fig. 5*a*, and the other two (2 and 3) remain, which are held in their places by the screws g^1, and g^1 (fig. 2*a*).

When the machine is employed for hewing or planing wood, a constant feed motion may be required to be given to the sliding carriage G G; and in that case, all the segments would be replaced.

When a constant motion is required to be given to the bed G G, for running back or otherwise, the wheel h^1 is slid out to the outside rim of the disc-wheel *g*, by means of a spring-clutch movement, or any other convenient means.

Another application of the rotary head stock or open jaws, which may be adopted in some cases to advantage, is shown in fig. 6*a*. The quoit-cutters in the open jaws C C, are here so arranged, as to pass over and cut past the centre of the stone F, alternately so as to leave a true or plane surface and arris. In this case the cutter comes on, or attacks the stone F at the side or edge, and cuts towards the centre, and passes off over the finished part of the stone, as indicated by the circular lines on stone F, the rotary jaws C C, carrying the cutters in the direction of the arrows. A circular motion could be given to the old-fashioned cutter-head, which would, in a great measure protect the corners of the stone, as shown in detail in fig. 7*a*. P P represent the circular side guide rails for the guide rollers O O O O, to run top and bottom, which carry the cutter head K, and cutters L.

Fig. 8a.



By reference to fig. 2a, it will be seen, that two or more sets of cutters can be mounted and set at any required angle for first roughing off the stone, and then a set of cutters can be set at a different angle or pitch in the same jaws for finishing the surface of the stone, and all done at the same time, which will have the same effect as passing the stone through the machine several times, or through several machines with different sets of cutters.

The cutter wheel proposed to be adopted in this machine is a ring or disc of steel, resembling a quoit, which is firmly held between two flanges of iron, one of which has a boss or projection to fit the opening of the disc, and the other a corresponding recess. These flanges are firmly held together by screws, as well as by the mandril, on which the cutter is mounted.

The machinery which has just been described might probably be usefully applied (with some slight modifications) to the cutting of tunnels and adits. For such purposes the cutters might be attached to the periphery of a wheel, or to the extremities of radial spokes, and brought to bear on the mass to be penetrated at the proper pitch or inclination.

NAUTICAL MODELS.

It is of importance both to the scientific investigation of the art of ship-building and to its practice as a trade that the extraordinary success of some vessels, and the disasters that have befallen others, should be made the subject of *continued* inquiry, till the causes of the one or of the other should have been ascertained; but, unfortunately, when the nine days' wonder has ceased, there usually ends investigation. Thus the *America's* victory was for a short time very generally discussed, and the sinking of the *Birkenhead* excited universal regret; yet in both instances when the first impression had passed away, then ceased inquiry as to the *cause* of the *America's* victory, and from

what imperfection of the *Birkenhead* she had so suddenly gone down.

At the time of the *America's* race with the *Titania*, the success of the former was attributed to a great variety of peculiarities that were said to be exhibited in her structure and rig, but the effect of them remains to this moment unascertained, and even their existence either doubtful, or proved to have been imaginary. Thus she was described at first as having sliding keels; it turned out that her keel was a fixed one. It was asserted that her speed depended on the favourable form of her hull; but when she was docked in Portsmouth Yard, the officers found that it differed little, if at all, from that given by Sir W. Symonds to his vessels. Other persons affirmed that the flatness of her sails was the sole cause of her speed,—as probably was true in a considerable degree. One important peculiarity seems, however, not to have been brought forward to the extent which its importance merited, namely, her immense *spread* of sail; a particular which perhaps could not be safely imitated in vessels for general navigation. Indeed, it is affirmed at Portsmouth that the *America* could not have crossed the Atlantic with such sails, and that, in fact, she did not; it is confidently said that, previously to coming to Portsmouth, she had put in at Havre, and there had changed the masts that had been furnished in America, and had also changed the whole of her sails and rigging, so as greatly to increase her spread of canvas. If this were really so, there seems little reason for imitation of this particular, since the power of navigating such seas as the Atlantic is more essential to our trading vessels than that of *excessive* speed. In truth, a *racing* spirit seems at present to be gaining ground at sea as on the turf, and is suspected of having caused not a few of the disasters the nation has lately had to lament, especially in regard to steamers; it is said to be on racing account that they so often prefer an in-shore passage to the safer but tardier one in the open sea. But whatever may have contributed to the *America's* victory, so long as particulars of build and rig remain unascertained, it may humiliate our naval constructors, but does not afford them any useful lesson.

So the loss of the *Birkenhead*, and of so many gallant men consequent upon it, excited a great sensation at the time, and at the moment much inquiry as to the cause of the disaster; but the investigation has not been pursued to any useful result, though there are few cases in which important points respecting her loss remain to be ascertained; particularly whether inaccuracy of the compass did, or did not, lead to her being steered too near to the rock upon which she struck, and how it happened that, having so many as twelve water-tight sections, she went down so suddenly notwithstanding them.

The question in regard to the compass seems one which it would be more easily decided by the Admiralty than by private persons, and it would be well worth bestowing upon it the little time and expense experiment would occasion. Doubtless, officers saved from the *Birkenhead* would know whether the compass on board that particular vessel had been affected by the iron of which she was constructed; and a few easy experiments on board of some iron ship would set the matter at rest. It would be worth publishing by authority the result, were it only to allay an apprehension that is gaining ground as to the insecurity of iron vessels on this account.

The security given by water-tight compartments was evinced even in the *Birkenhead*; for as it appears by an article from the *Liverpool Albion* (given in *ante* No. 1498), "The buoyancy of the after compartment alone was the means of giving time to get the boats out." That those compartments did not keep the vessel a still longer time from sinking seems unaccountable. Until three weeks ago, it was uniformly stated that the *Birkenhead*, soon after she struck, broke into two parts, and so went down; but in the *Illustrated News* of the 19th ult., there was a representation of this vessel when sinking, which showed her to be going down *entire*, headforemost, without any break athwartship whatever. The drawing was said to have been made by an eye-witness of the sad accident, one of those who had escaped from her, and that the blue lights burnt on board had afforded light enough to see the parts of the vessel distinctly. This is in contradiction to all previous accounts and evidence, yet

seems more probable than that a well-built ship should have divided crosswise into two distinct parts.

The engineer, Mr. Renwick, stated that the first blow of the vessel on the rock ripped open the compartment between the engine-room and the fore-peak, and the next blow stove in the bilge of the vessel in the engine-room, thus filling the two largest compartments in the vessel; these being so near the head, it could hardly have been expected that the buoyancy afforded by the remaining compartment at the head could have been sufficient to keep that part of the ship afloat, and would appear to demand credence for the representation given in the *Illustrated News* were evidence of the breaking in two of the ship less positive and general.

The Secretary of the Admiralty was asked in the House of Commons, whether the watertight compartments in the *Birkenhead* had been removed? and replied that they had not. But without their removal, they might have been rendered useless, supposing there had been means of communication between them, and that those apertures had been left open. Some inquiries have been made on the subject, but without any positive result. It is evident that the efficacy of watertight compartments ceases wherever communications of one with the other are left open; so that, however great the convenience of doors between them, it would be safer not to allow them to be made, so little dependence can be placed upon their being always securely closed.

When the *Birkenhead* was fitted as a troop-ship, a heavy poop and a heavy forecastle were added, to increase her accommodation: these weights at her ends might possibly have been the cause of her breaking across, and, if it really were so, should afford the wholesome lesson to forbear from making alterations in a ship which could weaken her. In this case, too, her sailing qualities were much diminished by her having been brought down in the water two feet beyond her intended load-line.

If the *Birkenhead* really did break clean in two athwartship, this would imply that she was less strong in the direction which failed, and would indicate the necessity of giving additional strength, especially in midships, where a vessel is so long in proportion to breadth as was the *Birkenhead*.

Private persons do not possess means of ascertaining many of the above-mentioned particulars, but it may be hoped that Government are at length roused to the making full investigations and exhaustive experiments; for the Admiralty have instituted such in regard to anchors, and the Board of Trade have caused a very full inquiry to be made as to the cause of the fire that destroyed the *Amazon*. Although Professor Graham, in his Chemical Report to that Board, states that the cause of that fatal fire must remain a matter of speculation and conjecture, yet he has elicited a fact that may save other ships, and many a building on land, from conflagration: he "found, on trial, that the vapour given off by oil of turpentine is sufficiently dense at a temperature of somewhat below 110° to make air explosive at the approach of a light." Whether oil of turpentine did or did not cause the destruction of the *Amazon*, he could not ascertain, for two of the witnesses examined said there *was* oil of turpentine in her store-room, but this was denied by the third witness. How difficult it is to elicit truth, even as to a fact so very simple!

Since the above was penned, the *America* has had another trial of speed in a race round the Isle of Wight, and has been beaten by two minutes; but no useful truth has been thereby elicited. One of her adversaries is said to have been altered so as in every respect to be a close imitation of the *America*, yet this vessel had only an advantage of two *seconds* over another competitor which does not appear to have been so altered. It seems, however, to have been proved that it is only in a stiff breeze that the *America* succeeds; it was stipulated, prior to last year's race, that she would not compete unless there were such an amount of wind, and it seems that her rivals in the late race were enabled to manœuvre advantageously with little wind, but that the *America* could not. Now as the best vessels for general navigation are those which can make good way under the greatest variety of winds, superiority is not to be ascribed to the one which, under particular circumstances, will beat another vessel on a short trip, but the palm is due to the vessel which evinces

her superiority in a series of long voyages, wherein she has had to encounter calms and storms no less than that precise amount of wind which best suits her. We are yet to learn how the *America* behaved in the Mediterranean.

M. S. B.

REFLECTORS ON LOCOMOTIVES.

Sir,—In the *Times* newspaper of July 15th, there is a notice of the employment of a mirror in the locomotive engines on the Austrian railways. Since then, another letter has appeared in the same paper, in which the writer lays claim to the suggestion, as having been made by him more than a year ago; and in the *Mech. Mag.* of last Saturday, a further communication appears from Mr. John Macgregor, in which he refers to a detailed proposal made by himself in your Journal of the 31st of March, 1849, for employing mirrors as above mentioned. I now write to say, that so far back as the summer of 1846, such mirrors were, at my suggestion, adapted to the engines and guard-boxes of the trains on the South Western Railway. The original experiment upon the utility of such an application was made upon a luggage-train, by myself and Mr. Louth, the station-master at Bishopstoke, in the neighbourhood of that locality, and was immediately afterwards practically adopted by the Company, as I have described. A clear and extensive back view of the train and road, for a distance of half a mile, was thus commanded without the necessity of turning the head; and these mirrors were only discontinued upon the engines because, in the opinion of the then locomotive superintendent (Mr. Gooch), the view which they afforded was likely to distract the attention of the drivers. Whether they are now affixed to the guards' boxes, I am unable to say; but I certainly think they ought to be, as they afford a simple and ready means of communication in case of danger between the different parts of a train,—the waving of a handkerchief or other such signal being instantly and distinctly seen.

I am, Sir, yours, &c.,

ISHAM BAGGS.

London, July 24, 1852.

ERICSSON'S CALORIC ENGINE.

(From the *New York Merchants' Magazine.*)

Two engines upon this plan are now in operation at the works of Messrs. Hogg and Delamater, at New York, one of 5-horse power, the other of 60-horse power; the latter has four cylinders, two of 6 feet diameter, side by side, surmounted by two of much smaller size. Within these are pistons exactly fitting each cylinder, and so connected that those in the lower and upper cylinders move together. A fire is placed under the bottom of each of the large cylinders, called the "working cylinders," those above being termed the "supply cylinders." As the piston in the supply cylinder moves down, valves at the top admit the air; as it rises these valves are closed, and the air passes into a receiver and regenerator, where it is heated to about 450°, and, upon entering the working cylinder, it is further heated by the fire underneath. At 480° the atmospheric air expands to double its volume, and, supposing the supply cylinder to be half the size of the working cylinder, the air which enters the supply cylinder, in passing through the regenerator, fills the working cylinder; in like manner, presuming that the area of the upper piston be 500 square inches, and that the air presses upon it with a mean force of ten pounds to each square inch, the air, when expanded to twice the volume in the lower cylinder, will exert the same pressure on each square inch of its piston. If the area of the lower piston be twice as large as that above, it follows that with a pressure of 5,000 lbs. exerted on the upper piston, we have a force of 10,000 lbs. applied to the piston in the working cylinder. This surplus power furnishes the working power of the engine. It will readily be seen that, after one stroke of its pistons is made, it will continue to work with this force so long as sufficient heat is supplied to expand the air in the working cylinder to the extent stated; for so long as the area of the lower piston is greater than that of the upper, and a like pressure is upon every square inch of each, so long will the greater piston push forward the smaller, as a two pound weight upon one end of a balance will be quite sure to bear down one pound placed upon the other. We need hardly say that, after the air in the working cylinder has forced up the piston within it, a valve opens, and, as it passes out, the pistons, by force of gravity, descend, and cold air again rushes into and fills the supply cylinder, as we have before described. In this manner the two cylinders are alternately supplied and discharged, causing the pistons in each to play

up and down, substantially as they do in the steam engine.

The most striking feature in this engine consists in what is called by its inventor the "regenerator." This structure is composed of wire net, somewhat like that used in the manufacture of sieves, placed side by side until the series attain a thickness, say, of 12 inches. Through the almost innumerable cells formed by the intersection of these wires the air must pass on its way to the working cylinder. In passing through these it is so minutely subdivided that the particles composing it are brought into close contact with the metal which forms the wires. Now, let us suppose what actually takes place, that the side of the regenerator nearest the working cylinder is heated to a high temperature. Through this heated substance the air must pass before entering the cylinder, and, in effecting this passage, it takes up, as is demonstrated by the thermometer, about 450° of the 480° of heat required, as we have before stated, to double its volume. The additional 30° are communicated by the fire beneath the cylinder. The air has thus become expanded; it forces the piston upwards; it has done its work; valves open, and the imprisoned air, heated to 480°, passes from the cylinder, and again enters the regenerator, through which it must pass before leaving the machine. We have said that the side of this instrument nearest the working cylinder is hot, and it should be here stated that the other side is kept cool by the action upon it of the air entering in the opposite direction at each up-stroke of the pistons. Consequently, as the air from the working cylinder passes out, the wires absorb its heat so effectually that, when it leaves the regenerator, it has been robbed of it all except about 30°. In other words, as the air passes into the working cylinder, it gradually receives from the regenerator about 450° of heat; and as it passes out this is returned to the wires, and is thus used over and over, the only purpose of the fires beneath the cylinders being to supply the 30° of heat we have mentioned, and that which is lost by radiation and expansion. Extraordinary as this statement may seem, it is nevertheless incontrovertibly proved by the thermometer to be quite true.

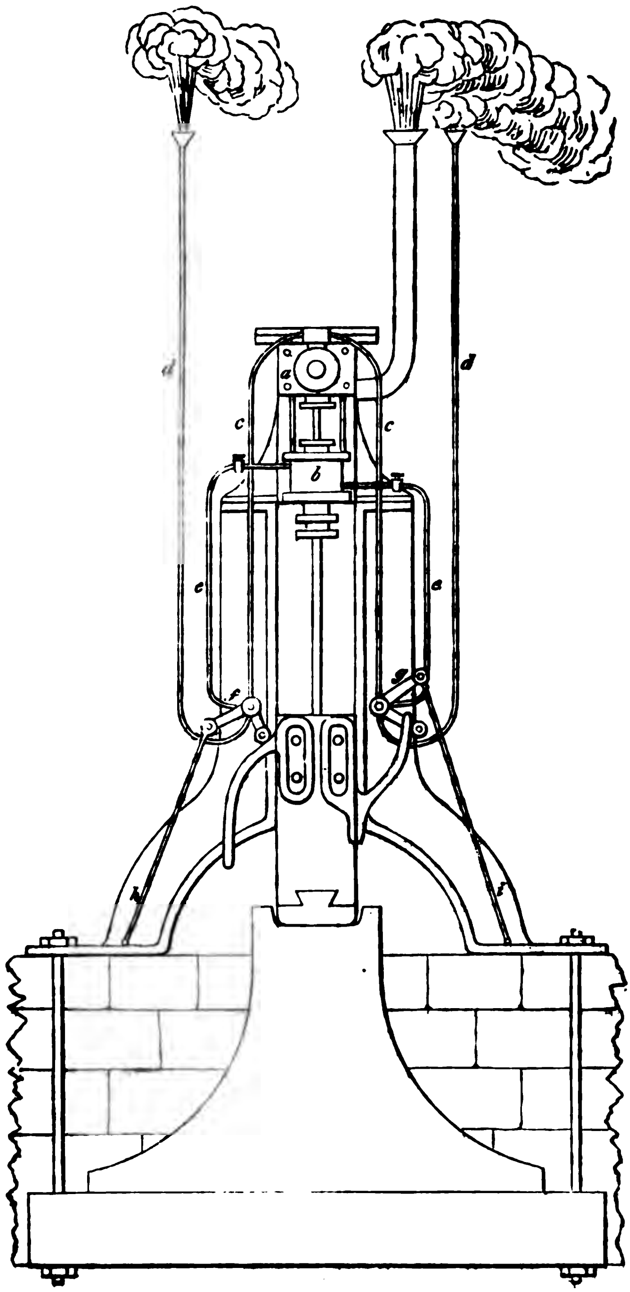
The regenerator in the 60-horse engine measures 26 inches in height and width internally. Each disc of wire composing it contains 676 superficial inches, and the net has 10 meshes to the inch. Each superficial inch, therefore, contains 100 meshes, which, multiplied by 676, give 67,600 meshes in each disc, and, as 200 discs are employed, it follows that the regenerator contains 13,520,000 meshes, and, consequently, as there are as many small spaces between the discs as there are meshes, we find that the air within is distributed in about 27,000,000 minute cells. Hence it is evident, that nearly every particle of the whole volume of air, in passing through the regenerator, is brought into very close contact with a surface of metal which heats and cools alternately. The wire contained in each disc is 1,140 feet long, and that contained in the regenerator is consequently 228,000 feet, or 41½ miles in length, the superficial measurement of which is equal to the entire surface of four steam boilers, each 40 feet long and 4 feet in diameter; and yet the regenerator, presenting this great amount of heating surface, is only about 2 feet cube, less than 1-1920 of the bulk of these four boilers.

This engine, according to the account from which we quote, has been run at full speed for 24 hours, with a consumption of only 960 lbs. of coal. After feeding the fires it continues to run three hours without replenishment, and after withdrawing them from the grates, it operates with full power for an hour, in consequence of the astonishing action of the regenerator alone.

A ship of 2,200 tons burden, to be fitted with these engines, is now being built by Messrs. Perrine, Patterson, and Stack; the engines, by Messrs. Hogg and Delamater, comprise four working cylinders, each of 168 inches in diameter. We know of no instance in which such an important invention has been brought before the public in so complete a form as to warrant its being carried out on a scale of the first magnitude from the outset.

BAGGS'S PATENT MACHINERY FOR CRUSHING GOLD QUARTZ AND METALLIC ORES.

The principle of applying the direct action of steam or of atmospheric pressure to the movement of a forge hammer has already formed the subject of various patents long since expired. The improvements, however, which have been made in the construction of this description of engine within the last few years have invested it with a certain degree of novelty, and it is in the application of the principle here named to a new and useful purpose, and in the details whereby that application is rendered practically efficacious, that the present invention consists. Wherever rollers and ordinary stamp-heads are employed for crushing ores, a separate and independent steam engine, with its shaft, fly-wheel, and connecting gear, is necessary to produce motion; but here the apparatus is complete in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itself, and the steam from a small boiler being once turned on, the required movements of the stamping engine are thenceforward automatic, and independent of extraneous aid. It feeds itself in adjustable proportion with pigs of coarse metal, pieces of rock or ore, and, as these are reduced to powder, it clears them away. The operation is entirely conducted in the dry way, no water being necessary, as heretofore. It is almost needless to speak of the immense power obtainable from the percussive force of steam, or the advantage of such an application as the present. In common forge hammers it is customary merely to *lift* the hammer by the force of steam, and then to allow it to fall by its own weight; but here the stamp is first gently lifted, and then suddenly blown down upon the material to be crushed with the full force of the steam. The consequence is, that every blow so produced is like a shot from a gun, and no fair-sized pieces of rock, ore, or regulus can for a moment withstand its power. The engine makes about 80 strokes per minute, and if a pig of coarse metal weighing about 2 cwt. be placed under the stamp-head, and allowed to advance by self-acting mechanism at the rate of about 2 inches for every blow, it may be, as it were, fairly beaten to pieces in about 20 seconds. Of the result a portion is in fine powder, and another portion rough, which last requires to be again passed through the engine to complete the pulverization. It is found in practice that a second and smaller machine upon the same principle is best adapted for this purpose.

The great difficulties encountered by the patentees were those involved in the motion of the valves, and in the feeding apparatus. The great violence of the blows rendered it a matter of extreme difficulty to produce any self-acting mechanism which should stand for an hour, so long as that mechanism was directly actuated by the stamp-head or other portion of the engine moving with it. The mode whereby this difficulty has been surmounted is shown in the accompanying engraving, where the engine is seen in elevation. Immediately in front of the large cylinder is placed a small one B, the piston rod of which is directly connected with the valve rod of the large cylinder. The supply pipes for admitting steam to the small cylinder are shown at *c c*, and the waste pipes at *d d*. The necessary connections with the small cylinder for the admission and escape of steam, are made by means of the curved iron straps, which are bolted to the face of the stamp, and which, in ascending and descending, alternately strike against the levers of the three-way cocks *f* and *g*. The velocity of the small piston, and of the slide valve which it moves, is regulated by means of two other cocks, which are shown immediately adjacent to the small cylinder; and in order to prevent the piston of the large cylinder from flying up with too great a force, and striking against the cylinder cover, an adjustable iron ring or stop is bolted to the piston rod of the small cylinder, so that the movement of the large slide valve for the up-stroke can be regulated to a nicety, and the steam wire drawn to any required extent.

It will be seen that, by this arrangement, all the strain and violence involved in the *direct* system of working the valves is entirely got rid of, and not only is the velocity of each particular movement under the will and control of the operator, but injurious concussion is so completely avoided, that notwithstanding the power and suddenness of the blows, the valve gearing and supplementary parts of the engine are moved without any strain, and with the lightness of a feather. The three-way cocks referred to, as they are alternately released from the pressure of the curved iron straps, spring back to their original position by the constant tension of the elastic bands *h* and *i*. These new stamping engines are already coming into operation both here and abroad, and they have given great satisfaction where they have been adopted. As presenting a combination of extreme power with great simplicity, portability, and cheapness, we cannot but recommend them to the notice of the mining world, and particularly to those who are contemplating the exportation of machinery for crushing gold quartz, or any description of metallic ore.—*Mining Journal.*

THE NAVAL DRY DOCK, PHILADELPHIA.

(From the *Franklin Journal* for June.)

The United States Dry-dock at this port having recently been completed, was successfully tested during the past month by the lifting and hauling out of the steam ship *City of Pittsburg*, of 2,200 tons burthen. This dock and appendages being the largest in the world, merits more than a passing notice. The lifting power consists of nine sections, six of which are 105 feet long inside, and 148 feet over all, by 32 feet wide, and 11½ feet deep; three of them are of the same length and depth as the others, but 2 feet less in width; the gross displacement of the nine sections is 10·037 tons, gross weight 4,145 tons, leaving a lifting power of 5,892 tons, which far exceeds the weight of any vessel yet contemplated. The machinery for pumping out the sections consists of two engines of 20, and two of 12 horse-

power. In connection with the sections (which form the lifting power of the dock), is a large stone basin, 350 feet long, 226 feet wide, and 12 feet 9 inches deep, with a depth of water of 10 feet 9 inches at mean high tide.

At the head of this basin are two sets of ways, each being 350 feet long, and 26 feet wide. These ways are level, and consist of the bed pieces, which are three in number, and firmly secured to a stone foundation; the central way supports the keel, while the sideways receive the weight of the bilge; these ways are of oak, and are finished off to a smooth surface. On the top of the bed pieces or fixed ways, comes the sliding ways or cradle, which are also 350 feet long and 26 feet wide, so constructed as to admit of being adjusted to the length of any vessel.

The operation of the dock is as follows:—The sections are sunk so as to allow the vessel to be floated in; as soon as she is secured in the proper position, the pumps are put in operation, when the sections begin to rise, and as soon as they come to a bearing on the keel, the bilge blocks are run in until they fit the ship. When all is secure, the sections are pumped out until the keel is some two or three feet above the water. If repairs that will only require a short time are contemplated, the vessel is kept on the sections, and no other portions of the dock used. But the *Pittsburg* was taken up for the purpose of testing the several parts of the dock, and after she was lifted out of the water the sections carrying the ship were floated into the basin in line with one of the sets of ways. When this is accomplished, the sections are filled with water, and rest on the bottom of the basin, which is of stone. Bed ways are now laid on the sections in line with those before mentioned. When they are secured they are greased, and the cradle is now slid under the ship, and she is blocked up on the cradle, and the blocks on the sections are removed. At this point of the operation a new instrument of power is brought forward for the purpose of hauling the ship from the sections on to the bed ways in the Navy-yard. It consists of a large hydraulic cylinder, having a ram of 15 ins. diameter and 8 feet stroke, and a power of 800 tons. On the top of this cylinder, and attached to it, are two vertical direct acting engines, with cylinders 16 inches in diameter, and 16 inches stroke, connected at right angles to one shaft, on which are four eccentrics for working four hydraulic pumps of 1¼ inch bore, and 6 inches stroke; the tank which carries the water for the press is also on the top of the cylinder, and forms the bed on which the pumps are secured. The boiler which supplies these engines with steam, is on a sliding cast-iron bed way, some 12 or 15 feet ahead of the hydraulic cylinder, and connected to it by two cast iron rods. This boiler is of the usual locomotive form, and has 85 tubes of 2 inches diameter, and 9 feet long. To get ready for operation, the hydraulic cylinder is slid down to the edge of the basin, its ram is run in, and a connection made by means of two side rods of wrought iron from the cross-head of the ram to the sliding cradle which carries the ship. The central bed way has key holes mortised through it horizontally, every eight feet, and there are projections from the hydraulic cylinder which have corresponding keyholes in them. Two cast iron keys, 24 inches wide, and 6 inches thick, are slid through the key holes on small wheels; these keys secure the cylinder to the central bed way; the engines and pumps being now put in operation, a pressure is brought on the 15-inch ram, and as soon as the pressure overcomes the resistance, the vessel must move. The estimated weight of the *Pittsburg* was 2,800 tons, exclusive of the sliding ways and blocking; the power required to start this weight on a level, greased surface, was 250 tons. As soon as the vessel has been moved 8 feet, the keys which hold the cylinder to the central way are withdrawn, and by means of a screw, which is attached to the head block of the ram, and driven from the engine, the cylinder and boiler are in their turn rapidly slid a head (the water in the cylinder being allowed to escape into the tank), when the cast iron keys are again slid in place, and the vessel moved another 8 feet. After the first starting of the *Pittsburg*, the power required to remove her was but 150 tons, and she was moved 260 feet in six hours. To push the vessel off, the cylinder and appendages are moved to the head of the ways, put on a turn-table and reversed, when it is again brought down to the cradle, and the cylinder being secured as before, the head of the ram is applied directly to the cradle, and the vessel shoved back on to the sections, which requires the same time and power as to haul them off. In docking and hauling out the *Pittsburg*, every part of the work gave the most entire satisfaction, no portion showing the least defect, and the time required to go through the various operations being less than was expected. But six sections were used for lifting in this operation, leaving three unemployed. It will at once be seen that the capacity of this dock exceeds that of the stone docks at New York, Boston, and Norfolk, combined; for united they can take but three vessels, while here, two of our longest war steamers may be hauled out

on the ways, and two frigates lifted on the sections. The advantages that must result from the facilities of repairing a vessel elevated into light and air over one sunk in a stone dock, are very great, and have only to be seen to be appreciated.

THE HIGH-PRESSURE SYSTEM OF THE WESTERN WATERS OF THE UNITED STATES. BY J. V. MERRICK.

In another part of this Number will be found a Table extracted from the report of proceedings in the Wheeling Bridge Case, containing (what are believed to be) reliable data respecting some of the steamboats now running on the Ohio and Mississippi rivers. An examination of some of the details of this Table will show conclusively a very curious fact respecting the practice of Western engineers, which, although it may before have been noticed, has been hitherto overlooked, or ignored in the construction of their machinery.

The Western steamboats are made on a peculiar type, which is to be found principally in that section of the country, and whose existence at this stage of improvement in river navigation only serves to show how far prejudice, and a spirit of servile imitation, can prevent advances dictated by science, or by successful experience elsewhere. They are, with but trifling exceptions, propelled by a pair of high-pressure inclined engines, bolted to timber frames, and with very long wooden connecting-rods; each engine being attached independently to its own wheel. They are placed on deck (which is within two or three feet of the surface of the water), and with the boilers occupy from one-third to one-half the length of the boat, and the whole breadth inside the wheel-houses. The valves are of the description known as "poppet," which till within a very recent period were made single, and required considerable power to work them, but are "double" (or balanced) on the new engines. Steam and exhaust-valves are worked by separate cams attached to their respective rock-shafts; provision is made for connecting these shafts when it is desired to work full stroke, but the cut-off is not adjustable. Each valve is lifted by a lever in the usual "safety valve" style, which lever stands parallel to the cylinder, and covers the tappets on the rock-shafts; the latter, of course, crossing the cylinder, near the middle of its length. The valves are not allowed to lift high enough to give an area of passage equal to their own, which in itself is usually smaller than given by the usual English and our own Eastern practice.

The boilers are cylindrical, with two flues; are set in brick work, and placed upon the deck forward of the engines; furnaces forward; and the flame, &c., passing under the shells to the after end, returns through the flues. It is the universal custom to carry steam of a very high pressure in the boilers; a circumstance which has now become a sort of proverb, and the results of which, combined occasionally with those of an opposite error in respect to the water level, may be found in the records of steamboat disasters in the United States, and present a lamentable' instance of reckless disregard for the safety of human life.

The object of the present article is to show that this high pressure, with all its attending evils, is entirely unnecessary; and it is so to this "curious fact," before adverted to, that it is now desired to call attention.

The application of an indicator to any of these engines would demonstrate this point; but as such attachment has not been made, so far at least as I am aware, recourse must be had to another method of proof.

The economical efficiency of a boiler depends on the relative proportions of its effective heating surface, grate surface, and least cross section of flues or chimney, and the rapidity of combustion, or consumption of fuel. The greater the rapidity with which combustion is carried on, the less perfect is it, and hence the less economical will it be. Hence (within certain limits), that boiler which burns least fuel *per square foot of grate*, in a given time, or, in other words, which has a larger grate to burn the same fuel, evaporates the greatest amount of water by the combustion of a pound of fuel. That boiler which presents the greatest extent of effective heating surface to the action of the combustible, will, of course draw from it the greatest useful effect with a given velocity of draft. Finally, the less the velocity of draft requisite, the greater useful effect will be obtained, since the products of combustion have more time to communicate their heat.

To compare, then, the circumstances attending the consumption of fuel with those of other instances, I shall take an average of five western packets (in order to obtain a mean result), and compare it with some steamer whose consumption per square foot of grate is about the same as theirs.

On referring to Bartol's *Marine Boilers*, we find that the steamer *Mayflower*, running on Lake Erie, consumes 6,160 pounds of bituminous coal per hour, on a grate of 151 square feet, or 40·8 pounds per square foot per hour; total heating surface, 4,791 square feet, or ·778 feet of surface per pound of coal per hour;

useful effect produced, 5·94 pounds of water per pound of coal.*

In the five packets before alluded to, and which are hereafter specified by name, the average consumption of fuel is 3,254 pounds of bituminous coal, or its equivalent per hour, on a grate of an average area of 79·2 square feet, or 40·87 pounds per square foot per hour: total heating surface averages 1,940 square feet, or ·596 feet of surface per pound of fuel per hour; being but ·766 that of the *Mayflower*.

The velocity of draft under these circumstances, since the same quantity of coal is burned per square foot of grate, would depend on the relation between the respective areas of flue and grate. In the five packets it is as follows:—

	Consumption of bituminous coal per hour per square foot grate.	Ratios of areas of grate to flues.
Clipper, No. 2	43·00	1 to ·1250
Hibernia, No 2	37·37	1 to ·1336
Bostona,	39·06	1 to ·1780
Buckeye State	49·72	1 to ·1830
Messenger, No. 2	35·22	1 to ·1654
Mean	40·87	1 to ·1570

Or an average ratio of 1 to ·1570, while in the *Mayflower* it is 1 to ·1780; whence it follows that to allow the same amount of air, &c., to pass, the velocity required in the western boats must be to that in the boiler of the *Mayflower* as 1·134 to 1·000, and hence that in the latter case more useful effect would probably be obtained from the fuel.

Finally, the boiler of the *Mayflower* is a single "rising flue," while those of the western boats are cylindrical, and it is known that in the latter form, the proportion of *effective* in the total heating surface is less than in the former. Since, then, all the circumstances are concurrent to more perfect combustion in the boiler of the *Mayflower*, and since in that case the usual effect is as 5·94 to 1, it appears that from 4½ to 5½, to 1 will be a fair allowance as a *maximum* effect in the western boats. In order to allow for the difference in temperature of the water entering the boilers, and to insure a perfectly fair comparison, I shall employ in it the higher number of 5·5 pounds of water to a pound of fuel, as the maximum useful effect.

Having determined this point, it remains to show that with this *maximum* of evaporation, it is impossible to produce a volume of steam sufficient to fill the cylinders, at their point of cutting off, and number of revolutions per minute, with steam of any thing like the pressure carried in the boilers.

Referring to the Table, we obtain the following calculation, which is tabulated for comparison;—

	Names of Packets.	Space displacement of piston for each double stroke at point of cutting off.	Revolutions per minute.	Consequent volume of steam used per minute.	Consumption of fuel per minute.	Calculated vol. water evaporated at the above standard.	Ratio vol. steam to vol. water.
1	Clipper No. 2	58·61 cubic feet.	22	1289 cu. feet.	42·42 lbs.	3·633 cu. ft.	343
2	Hibernia, No. 2	91·66 ,,	19	1742 ,,	49·81 ,,	4·785 ,,	394
3	Bostona, ...	77·66 ,,	20	1553 ,,	52·09 ,,	4·583 ,,	339
4	Buckeye State,	91·66 ,,	18	1650 ,,	71·35 ,,	6·279 ,,	261
5	Messenger, No. 2.	78·59 ,,	19	1493 ,,	50·53 ,,	5·362 ,,	278
		Average		1545 ,,	53·24 ,,	4·928 ,,	322·4

Giving as an average result, a volume whose corresponding pressure is 74·7 pounds above the atmosphere; while that carried in the boilers was respectively 150, 150, 145, 140, and 150; average, 147 pounds; difference between boiler pressure, and maximum average cylinder pressure as 72·3 pounds.

I am not to be understood as saying that the pressure never exceeds this point; far from it. It is very possible that at the commencement of a stroke, or at some point in it, it may be higher: but simply, that the *average* pressure during the time for the admission of steam, cannot differ greatly from the one named.

It may be very true that the consumption of fuel is, of all other data respecting the performance of an engine and boilers, the least reliable; since different firing, different qualities of coal, and differently arranged

* The author states it at 6·3 pounds, but informs us at the end of the work, that this is based on the supposition that there is no difference between boiler and cylinder pressure; assuming this at 2 pounds, which may be called a minimum, 5·94 is the real coefficient.

boiler surface, &c., may modify the useful effect within wide limits; but when it is considered that on the one hand, the *May-flower* is a boat (running on Lake Erie) burning the same quality of fuel as the Western boats; that her consumption is the average of her running trips; that it was certainly not to the interest of the reporter to magnify that consumption, when it was known that the report was intended for publication; and, on the other hand, that an average of *five* packets, running on different routes, and supposed to have all the modern improvements, &c., was taken with an average of their running consumption through the whole trip; that it was certainly not to the interest of those reporting their performance to name a *less* amount of fuel than the true consumption (since, other things being the same, a diminished consumption would require a diminished height of chimney), it is certainly, in view of these points, not possible to conceive that the maximum pressure in the cylinders as calculated can vary greatly from that actually maintained.

It will be observed that the least volume in the Table just given (that of No. 4) gives a pressure of 96·6 lbs. above the atmosphere; while the greatest volume (that of No. 2) gives a pressure of 58 lbs.; mean, 77·3.

Why, then, it will be asked, is this tremendous pressure carried, if so useless in propulsion? Among other reasons may be named—1st. Custom and prejudice, which, on the western waters, require a high pressure of steam to be maintained; otherwise the boat is not considered either fast or powerful. 2nd. The absurd notion existing among a large class of their engineers, that steam has a momentum or impact which, at high pressures, imparts a force to the piston over and above that due to its pressure, when considered as a compressed and elastic vapour. 3rd, and most probably the principal reason—a contraction in the steam openings and pipes, which increases the friction due to the passage of steam at such high pressure, and diminishes the velocity at which it can be supplied to the cylinders, thus rendering necessary a great difference between the boiler and cylinder pressure.

If these reasons are just, the remedies are quite as plain, and need not be enlarged upon. It is easy to increase the area of passages, and insure a liberal supply of steam to the cylinders, even though such augmentation be attended with increased expense; and expense should be no object when viewed as a certain means of obviating the *necessity* for carrying this dangerous pressure of steam. Then legislative enactment must lend its aid to compel engineers to work their boilers at the minimum pressure, which, with wide throttles, will be found as efficient as the present system.

There is, therefore, no doubt that a much lower pressure of steam might, with the same engines, perform all that is done by the exalted pressure now carried so universally; while at the same time the comfort, economy, and, above all, the safety of the boats, would be vastly increased.

But there is another means of overcoming the difficulty, and of increasing the economy of these packets, viz., the employment of condensing engines, which would at once cut down the requisite initial pressure 12 to 14 lbs. per square inch, and by lessening the work of the boilers, permit a more perfect combustion of fuel. And although prejudice has done its utmost to prevent, or rather to postpone, in that section of the country, this improvement, high pressure engines will as certainly be driven from the western rivers, at some future day, as they have been from the lakes within the past few years. Their use on Lake Erie, which was formerly the *rule*, forms now a bare exception.—*Franklin Journal, May*, 1852.

EXPERIMENTS WITH CENTRIFUGAL PUMPS AT THE CRYSTAL PALACE.

To determine the useful effect of Appold's pump, a series of experiments were made under the direction of Colonel Morin, the Vice-chairman of the Jury. The results of these experiments are detailed in the following Table.

The work of the motive power was determined by the well-known dynamometer, constructed by M. Morin, on a principle proposed by General Poncelet. It is the distinctive feature of this dynamometer that it registers each effort of the motive power with the space through which the machine is driven by that effort, however variable it may be; and that it does this, not for a single stroke of the engine, or revolution of the wheel by which the machine is driven, but continuously, for a lengthened period. The dynamometer was applied to a drum, a strap from which drove the pump. To ascertain the work yielded by the pump, the water, raised by it from a reservoir beneath the floor on which it stood, to a given height above it, was received into a reservoir on the floor, wherein was an aperture of a rectangular form through which it could flow back into the reservoir, and which could be opened or closed to any extent by a slide. When the pump was set to work, the dimensions of the aperture were so adjusted by means of the slide, that the water remained steadily

at the same height in the reservoir. The quantity of water which escaped by the aperture was then obviously the same with that raised by the pump. The dimensions of the aperture and the depth of the water being known, the quantity of water which escaped could be calculated, and thus the water raised by the pump was known.

To ascertain the influence of the curved form of the vanes on the efficiency of the pump, straight vanes were applied to a wheel of the same size, worked under the same circumstances. The results are stated in the Table.

The pumps of Mr. Gwynne and Mr. Bessemer, on which similiar experiments were made, the particulars of which are detailed in the Table, had straight vanes.

Experiments on Appold's Centrifugal Pump.

Number of Experiment.	Height to which the Water is raised.		Discharge per Minute.		Ratio of power to Effect.	Revolutions of Wheel per Minute.	Remarks.
Curved Arms.							
	Feet.	Metres.	Gallons.	Litres.			
1	8·2	2·59	2,100	9,540	0·588	828	All these experiments were made with Poncelet's and Morin's Dynamometer.
2	9·0	2·745	1,664	7,440	0·648	630	
3	18·8	5·69	1,164	5,274	0·649	792	
4	19·4	5·897	1,236	5,610	0·680	788	
5	19·4	5·897	1,248	5,676	0·650	800	
6	26·2	7·97	432	1,962	0·398	843	
7	27·6	8·235	681	3,090	0·463	876	
Straight Arms, inclined at 45°.							
1	18·0	5·48	560	2,544	0·398	694	
2	18·0	5·48	736	3,348	0·434	690	
Radial Arms.							
1	18·0	5·48	369	1,674	0·232	624	
2	18·0	5·48	474	2,148	0·243	720	

Experiments on Gwynne's Centrifugal Pump. (Straight Parallel Radial Channels.)

Number of Experiment.	Height to which the Water is raised.		Discharge per Minute.		Ratio of power to Effect.	Revolutions of Wheel per Minute.	Remarks.
	Feet.	Metres.	Gallons.	Litres.			
1	13·8	4·17	290	1,320	0·19	675	Experiments made with Dynamometer.
2	13·8	4·17	280	1,272	0·19	920	

Experiments on Bessemer's Centrifugal Pump. (Radial arms and conical sides. Experiments made with M'Naught's Indicator.)

Number of Experiment.	Height to which the Water is raised.		Discharge per Minute.		Ratio of power to Effect.	Revolutions of Wheel per Minute.	Remarks.
	Feet.	Metres.	Gallons.	Litres.			
1	3·37	1·027	832	3,781	0·18	60	
2	3·62	1·158	1,006	4,567	0·13	71	
3	2·2656	0·700	—	—	—	40·5	No water thrown. The water just kept suspended up to the level of lip.
4	3·427	1·100	896	4,067	—	60	
5	3·28	1·000	846	3,840	0·225	60	

Jury Report, Great Exhibition—Class V., Professor Moseley, Reporter.

DRAINAGE OF HAARLEM MEER.

It appears from a paper by Mr. Grainger, C.E., before the Scottish Society of Arts, that this great work is now nearly approaching its completion. The pumping was commenced in May, 1848, from which date to April 30, 1851, the lake had been lowered 7 feet 3 inches, which was the state of matters when the subject was last brought before the Society. During the months of May, June, July, August, September, and October, very satisfactory progress was made, notwithstanding that a considerable quantity of rain fell in August and September, the level reached at the end of October being 9 feet 7·74 inches below the original surface, or at an average rate of 4·79 inches per month. In November a great quantity of rain and snow fell, raising the level about 4 inches; and in December the weather was still unfavourable, so that at the end of that month the level stood at 9 feet 5·58 inches below the original surface, or a total gain since April 30, of 2 feet 2·58 inches, or 3·32 inches per month. This progress may appear to be inconsiderable; but, when it is recollected that the lowering of the lake one inch involves the raising of upwards of four millions of tons of water, and allowing for the rain and snow falling during these eight months, there could not have been less than 186,000,000 tons of water pumped up during that period, the performance will appear great indeed. To give a better idea of this, it was stated that 186,000,000 tons is equal to a mass of solid rock one mile square and 100 feet high, allowing 15 cubic feet to a ton. The average progress has been less last year than what it was in the preceding one; but this is readily accounted for by the *increased lift* of the pumps, and by the difficulty of forming the channels which lead the water to them. At the commencement of these operations, the average depth of the lake was 13 feet 1·44 inches, and as 9 feet 5·58 inches have been pumped out, there only remained at the end of December last an average depth of 3 feet 7·786 inches. It is, therefore, trusted that the drainage will be completed, if not in the autumn of this year, at least in the summer of 1853.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JULY 29, 1852.

James Aikman, of Paisley, North Britain, calenderer. *For improvements in the treatment or finishing of textile fabrics and materials.* Patent dated January 20, 1852.

The improvements described and claimed by Mr. Aikman have relation,

1. To a particular arrangement of machinery or apparatus for twisting shawl fringe, and other similar ornamental articles.

2. To an arrangement of apparatus for breadthening, or stretching in the direction of their width, woven and textile fabrics.

John Whitehead, the younger, of Elton, near Bury, dyer and finisher, and Robert Diggle, of the same place, foreman. *For improvements in bleaching and dyeing, and in washing, scouring, and other processes connected therewith.* Patent dated January 20, 1852.

This invention consists in uniting together, or combining two or more apparatuses, through which fabrics undergoing the operations of bleaching and dyeing are caused to pass continuously, instead of employing a separate apparatus for each operation or treatment; also in a peculiar arrangement of apparatus for washing and scouring, to be used in connection with the process of dyeing.

Claims.—1. The combination of two or more vessels or apparatuses through which cotton or linen piece goods are caused to pass continuously, for the purpose of undergoing two or more treatments. Also the combination of two or more vessels or apparatuses provided with revolving agitators and squeezing-rollers, for washing only, as connected with the processes of bleaching and dyeing.

Frank Clarke Hills, of Deptford, manufacturing chemist. *For improvements in manufacturing and purifying certain gases, and in preparing certain substances for purifying the same.* Patent dated January 22, 1852.

The improvements in manufacturing gas have relation to that produced by decomposing steam with the vapour of coal-tar, and consists of several processes and arrangements of apparatus for this purpose.

The improvements in purifying gas consist in using for that purpose muriate of lime, or magnesia mixed with lime, or magnesia, or both, the process being performed as in dry-lime purification.

The improvements in preparing substances for purifying gas consists in renovating carbonate of lime and of magnesia for such purposes, by expelling their carbonic acid by the aid of heat, and in using continuously the subsulphate and oxichloride of iron, and such oxides of iron as are suitable for purifying gas, by supplying with the gas to be purified a volume of atmospheric sufficient to reoxidize the spent purifying materials.

Walter Marr Brydone, of Boston. *For improvements in apparatus for signal and other lights for railways.* Patent dated January 22, 1852.

The invention claimed by the present patentee consists in the use of candles as a means of illumination for signal and other lights on railways. When used for signal lights, the lanterns are to be constructed with suitable arrangements for burning the candles; and the working of the signals is effected in the same manner as usually practised. The patentee also uses candles for lighting the interior of railway carriages, and in this case he places the candle-lamp in a space removed from the partition, between two compartments of the carriage, so as to enable both compartments to receive light from the same lamp.

Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury. *For certain improvements in railways and locomotive engines, which said improvements are also applicable to every kind of transmission of motion.* (A communication.) Patent dated January 22, 1852.

These improvements consist—

1. In the use of angularly-grooved and wedge-shaped wheels, working together, for the transmission of motion, and in lieu of cogged wheels, straps or bands.

2. In the application of the same arrangements to railway carriages.

3. In a means of varying the velocity of the piston of steam engines for locomotives and other purposes by means of such an arrangement.

Edward Tyer, of Queen's-road, Dalston, gentleman. *For certain improvements in the means of communication by electricity, and apparatus connected therewith.* Patent dated January 22, 1852.

These improvements are intended to enable communications to be made between carriages in motion on railways and stations on the line, and *vice versâ*, from the stations to the carriages. By Mr. Tyer's arrangements, the engine of a train, on arriving at a certain distance from a station, is made to signalise the station, and at the same time receives a signal from the station giving warning if an obstruction exists, or if the line is clear; and, again, on a train leaving a station, and arriving at a certain point beyond it, a signal is made to give notice of the same to the station just left, in order that, in the event of an obstruction or stoppage, the next succeeding train may be detained until the line is again clear. Mr. Tyer does not confine himself to any precise arrangements of apparatus for effecting communications in this manner.

James Pillans Wilson and George Fergusson Wilson, of Wandsworth, gentlemen. *For improvements in the preparation of wool for the manufacture of woollen and other fabrics, and in the process of obtaining materials to be used for that purpose.* (Partly a communication.) Patent dated January 22, 1852.

This invention consists in the use of oleic acid obtained from distilled fatty acids, and especially from that of palm oil, as a lubricating material in the manufacture of woollen goods. The oleic acid is obtained in a liquid state by subjecting oleic acid to the action of a cold atmosphere, and then pressing it to separate the solid matter, and allowing the pressed-out fluid to stand to precipitate any solids still held in suspension in it. The acid used in its manufacture is separated by repeated washings in water heated by steam.

Claims.—1. The use in the preparation of wool for the manufacture of woollen and other fabrics of oleic acid obtained from distilled fatty acids.

2. The use in the preparation of wool for the manufacture of woollen and other fabrics of oleic acid, which has been treated by a preparatory process for the purpose of freeing the same from solid matters and mineral acid.

3. The process of obtaining oleic acid free from solid matter and mineral acid as a material to be used in the preparation of wool as aforesaid.

John Dennison, of the firm of John Dennison and Son, of Halifax, York, and David Peel, of the same place, manufacturers. *For an improved lubricating compound.* Patent dated February 9, 1852.

The patentees commence their specification by observing that in the preparation of wool, rag-wool, and flocks for spinning into yarns, it is necessary and usual to lubricate the same either after they have been washed and scoured, or while in their primitive state sometimes termed "blending" with oil (commonly gallipoli, olive, rape, or whale oil), in order to lay and smoothen the fibres, and thereby facilitate the subsequent operations of teazing, scribbling, slubbing, and spinning; and that the expenditure for such lubrication adds largely but unequally to the cost of manufacturing woollen yarns (the coarser and least valuable sorts of wool, rag-wool, and flocks, requiring the largest quantities of oil), and is, in all cases, more or less burdensome. They then proceed to state that the nature of their invention consists in the manufacture of a new lubricating compound which may be advantageously substituted for the oil so presently used in the preparation of wool, rag-wool, and flocks; not only costing much less, but serving the purpose better, and which new compound may also be applied in most other cases where a cheap, effectual, and innocuous means of lubrication is desirable.

The manner of manufacturing the said new lubricating compound, is as follows: The patentees take a quantity of sea-weed, and boils it to a jelly in water. The quantity of water used should be just about sufficient to produce four gallons of jelly from every pounds weight of sea-weed (for the sea-weed, kelp prepared therefrom, or barilla, may be substituted, but they prefer to use the sea-weed itself). They then draw off the jelly, leaving the refuse matters behind, and add to it, while yet warm, gallipoli, olive, rape, whale, or some other oil of like properties, in the proportion of from one-fourth to three-fourth parts of oil to each part of jelly, mixing the jelly and oil thoroughly by any convenient mechanical means. They thus obtain, at about less than one-half the cost of the oil, a compound which is possessed of much more valuable properties; for not only are the wool, rag-wool, or flocks, when treated with this compound, easier to scribble or spin than when blended with oil, but the yarns, when made into warps, do not require to go through the ordinary process of sizing (owing, no doubt, to the glutinous quality imparted to the material by the new compound), and are ultimately stronger and better, producing, of course, a superior description of cloth. The proportions of the oil and jelly to one another may, as has been stated, vary from one to three-fourth parts of jelly to each part of oil; that is to say, any combination of the materials within these limits, or thereabouts, will be useful for lubricating purposes; and the patentees do not restrict themselves to any specific proportions. But they may observe that, according to their experience, the best proportion (for the woollen manufacture, at least) is one part of the jelly for every part of oil.

Claim.—The preparation of a compound for lubricating purposes, consisting partly of oil and partly of the jelly obtained as aforesaid, in the proportions before specified, or any other suitable proportions.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Henry Bessemer, of Baxter House, Old St. Pancras-road, for improvements in the manufacture, refining, and treating sugar, part of which improvements are applicable for evaporating other fluids. July 24; six months.

Henry Houldsworth and James Houldsworth, both of Manchester, silk manufacturers, for certain improvements in the fixing, extending, and holding of cloth to receive embroidery, and in apparatus applicable thereto. July 27; six months.

James Denton, of Oldham, Lancaster, spindle and fly-maker, for certain improvements in machinery or apparatus for preparing cotton and other fibrous materials. July 29; six months.

Frederick Winter, of Eldon-street, Finsbury, roche manufacturer, for certain improvements in the construction of machinery for supplying rotatory motion to carriages, vessels, and water-mills. July 29; six months.

John Martin, of Barmer, Norfolk, farmer, for improvements in implements for hoeing. July 29; six months.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for certain improvements in the manufacture of sheet iron. (Being a communication.) July 29; six months.

Pierre Armand Lecomte de Fontainemoreau, of South street, Finsbury, for certain improvements in the construction of taps and cocks for fluids and liquids. (Being a communication.) July 29; six months.

LIST OF SCOTCH PATENTS FROM THE 22ND OF JUNE TO THE 22ND OF JULY, 1852.

John Davie Morries Stirling, of Black-grange, N. B., Esq., for certain alloys and combinations of metals. June 22; six months.

Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman, for improvements in separating substances of different specific gravities. (Communication.) June 23; six months.

John Henry Johnson, of Lincoln's-Inn-Fields, Middlesex, and of Glasgow, N. B., gentleman, for improvements in steam engines. (Communication.) June 28; six months.

John Linton Arabin Simmons, of Oxford-terrace, Hyde-park, Middlesex, captain in the Royal Engineers, and Thomas Walker, of the Brunswick Iron Works, Wednesbury, Stafford, Esq., for improvements in the manufacture of ordnance, and in the construction and manufacture of carriages and traversing apparatus for manufacturing the same. June 28; four months.

Frederick Sang, of Pall-Mall, Middlesex, artist in fresco, for improvements in machinery or apparatus for cutting, sawing, grinding, and polishing. June 30; six months.

Peter Bruff, of Ipswich, Suffolk, civil engineer, for improvements in the construction of the permanent way of rail, tram, or other roads, and in the rolling stock or apparatus used therefor. July 5; six months.

George Laycock, of Albany, in the United States of America, dyer, but now of Doncaster, York, tanner, for improvements in tanning and unhairing skins. July 6; four months.

Robert John Smith, of Islington, Middlesex, for certain improvements in machinery or apparatus for steering ships or other vessels. July 7; four months.

James Higgin, of Manchester, Lancaster, manufacturing chemist, for certain improvements in bleaching and scouring woven and textile fabrics and yarns. July 8; six months.

William Beckett Johnson, of Manchester, Lancaster, manager for Messrs. Ormerod and Son, engineers and ironfounders, for improvements in railways, and in apparatus for generating steam. July 12; six months.

Richard Paris, of Long-Acre, Middlesex, modeller, for improvements in machinery or apparatus for cutting and shaping cork. July 12; six months.

Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, London, Middlesex, for improvements in the apparatus for kneading and baking bread, and other articles of food of a similar nature. (Communication.) July 13; four months.

Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman, for improvements in machinery for cutting soap into slabs, bars, or cakes. (Communication.) July 15; six months.

Richard Laming, of Millwall, Middlesex, chemist, for improvements in the manufacture and the burning of gas, in the treatment of residual products of such manufacture, and of the distillation of coal or similar substances, and of the coking of

coal, and in the application of a certain substance which may be obtained from such treatment to the manufacture of paper. July 13; six months.

William Reid, of University-street, electric telegraph engineer, and Thomas Watkins Benjamin Brett, of Hanover-square, gentleman, for improvements in electric telegraphs. July 19; six months.

Emery Rider, of Bradford, Wilts, manufacturer, for improvements in the manufacture or treatment of India-rubber and gutta percha, and in the applications thereof. July 19; six months.

Charles Augustus Preller, of Abchurch-lane, London, gentleman, for improvements in the preparation and preservation of skins and animal and vegetable substances. July 19; six months.

Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, London, for certain improvements in railways and locomotive engines, which said improvements are also applicable to every kind of transmission of motion. (Communication.) July 21; four months.

Joseph Maudslay, of the firm of Maudslay, Sons, and Field, of Lambeth, Surrey, engineers, for improvements in steam engines, which are also applicable wholly, or in part, to pumps and other motive machines. July 21; six months.

William Septimus Losh, of Wreay Syke, Cumberland, gentleman, for improvements in obtaining salts of soda. July 21; six months.

Richard Archibald Brooman, of the firm of J. C. Robertson and Company, of 166, Fleet-street, London, patent agents, for improvements in the purification and decoloration of oils, and in the apparatus employed therein. (Communication.) July 21; six months.

Robert Hesketh, of Wimpole street, Mary-le-bone, Middlesex, for improvements in apparatus for reflecting light into rooms, and other parts of buildings and places. July 22; six months.

Edward Maitland Staples, of Cheapside, for improvements in cutting mouldings, tongues, and other forms, and planing wood. July 22; six months.

LIST OF IRISH PATENTS FROM THE 18TH OF MAY TO THE 16TH OF JULY, 1852.

Julian Bernard, now of Guilford-street, Russel-square, late of Green-street, Grosvenor-square, Middlesex, gentleman, for improvements in the manufacture of leather, or dressed skins of the materials to be used in lieu thereof, of boots and shoes, and in materials, machinery, and apparatus connected with or to be employed in such manufactures. May 25.

Stewart M'Glashen, of Edinburgh, sculptor, for the application of certain mechanical powers to lifting, removing, and preserving trees, houses, and other bodies. May 26.

Jean Theodore Coupier, and Marie Amedée Charlies Mellier, both late residing at Maidstone, Kent, at present of Golden Bridge Mills, near Dublin, gentlemen, for certain improvements in the manufacture of paper. June 2.

Peter Fairbairn, of Leeds, York, machinist, and Peter Swires Horsman, of Leeds aforesaid, flax spinner, for certain improvements in the process of preparing flax and hemp for the purpose of heckling, and also machinery for heckling flax, hemp, China grass, and other vegetable fibrous substances. June 3.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
July 23	3341	T. A. Readwin	Winchester-buildings	Revolving cutter and scythe-reaping machine.
28	3342	G. Whatton and D. Reading	Chambers-street	Roller box for ships' blocks and various kinds of axles, &c.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

July 28	449	Capt. A. Collingridge	Brompton	Cygnet hook.
,,	450	J. Browne	Upper Norton-street	Ventilating wreath, or pillar band, for hats and caps.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Joseph Clinton Robertson, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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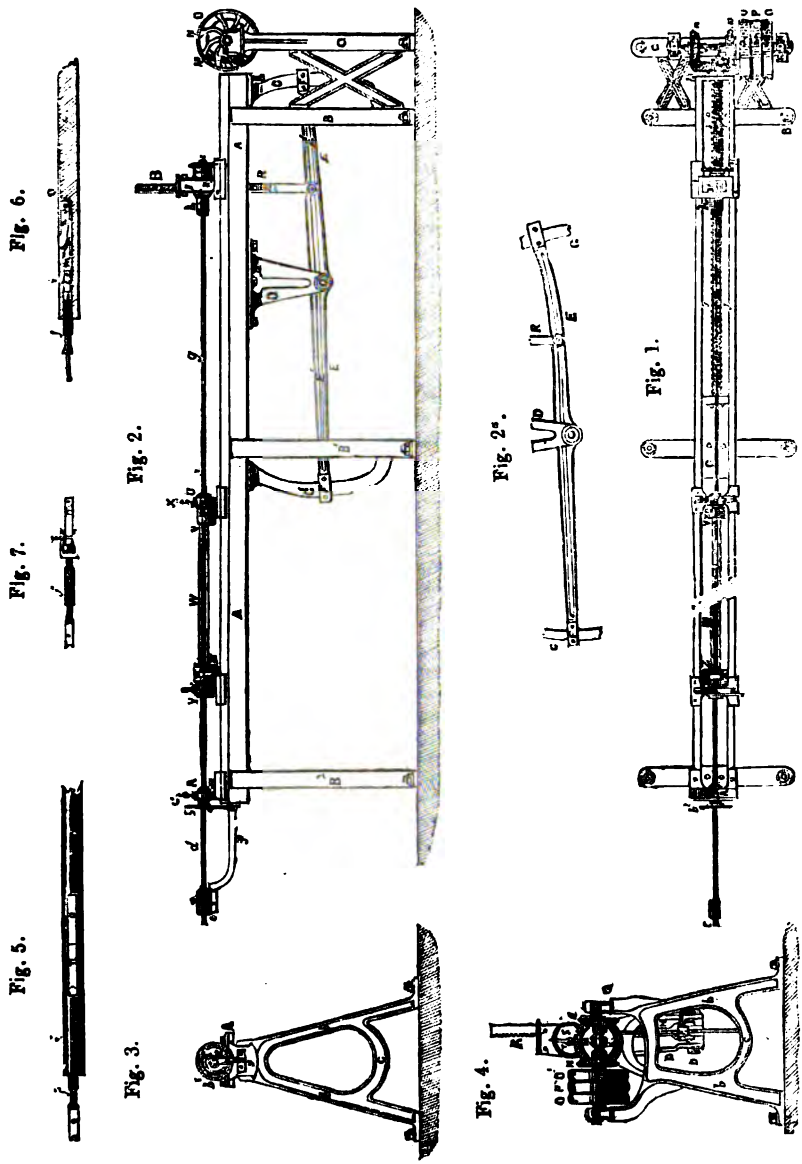
MANCEAUX'S PATENT RIFLING MACHINE, FIREARM SIGHTS AND PROJECTILES.



MANCEAUX'S PATENT RIFLING MACHINE, FIREARM SIGHTS AND PROJECTILES.

(Patent dated January 29, 1852. Patentee, M. F. J. Manceaux, of Paris. Specification enrolled July 29, 1852.)

Specification.

My improvements consist, *firstly*, of a machine for rifling the barrels of fire-arms of the construction represented in the engravings annexed, figs. 1, 2, 2^a, 3, and 4.

In all machinery for rifling or grooving the insides of barrels of fire-arms hitherto known, it has been necessary to make use of a guide to determine the proper spiral twist to be given to the rifling; whence it follows that, for fire-arms—such as carbines and pistols, the length and bore of which may be greatly varied, and which, consequently, require corresponding variations in the spiral twist of the rifling—a great number of different guides become requisite. Now as these apparatuses have to be made with peculiar accuracy, they form a burdensome and costly item in the manufacture of rifled fire-arms, besides delaying the process considerably.

The rifling machine which forms the subject of this part of my improvements imparts to the rifling, without the assistance of any other instrument, any desired degree of twist from a straight line to the extent of four turns in three feet, including all the intervening fractions; and moreover it is capable, without any change in or addition to the apparatus, of rifling both in a right and left-hand direction, and either to an equal depth throughout the whole length of the barrel, or else a varying depth; that is to say, progressively diminishing from the breech to the muzzle. The advantages resulting from this latter method are such as are likely to make it generally preferred, because the gradual reduction in the depth of the rifling compresses the projectile more and more closely in its passage towards the muzzle, imparts greater force or vigour to it, in consequence of the more perfect obturation or shutting up of the barrel, and the greater consequent compression of the gases which expel it, and finally ensures its more perfect rotary motion. The gradual decrease in the depth of the groove, whereby the thinner and weaker parts of the barrels are but slightly grooved or cut into, allows of all existing smooth barrels being grooved or rifled without danger. Rifles may also be made much lighter than hitherto.

Fig. 1 is a plan of this rifling machine; fig. 2, a side elevation; fig. 3, a back end view; and fig. 4, a front elevation. A is a cast-iron table or bed, similar to a lathe-bed, which is mounted on three legs, B, B^1, B^2—each leg being composed of two standards *b b*, joined by a cross piece *c*, as shown in figs. 3 and 4. C is a support let in at the middle of the bed, to carry the end of a screw J hereinafter mentioned.

D D, fig. 2, are brackets fixed under the bed, which carry an inclined bar or lever E, the inclination of which may be changed at pleasure. It is centred at D^1, and has on each side a groove E^1 throughout its whole length: it is fixed at each end by means of a split mortise F to two stationary sectors G G^1; one of these sectors, G, is fixed at one end to the underside of the bed A, and the other to the cross piece of the front leg B. The other sector G^1 has one of its ends fixed to the under side of the bed, and the other to the cross piece of the leg B^1. The bar may be made to rise and fall at pleasure to the right or left, and is kept in any desired inclined position by means of an adjusting screw H.

Fig. 2^a is a modification of this inclined bar or lever, in which a sharp turn or sudden slope is given to it at one end, in order to impart a sharp twist or angle to the rifling when desired. I, is a carriage which slides on the bed A from the front end as far as the support C. This carriage has a brass nut in its lower end, into which works a four square threaded screw J. This screw is centred at one end on the support C, and at the other end fits into an aperture in the front of the bed, through which it passes as far as a flange in the collar K, at which point it is kept by a stay L and two screws. The screw J is actuated by a bevelled toothed wheel M.

N N^1 are two parallel bevelled toothed wheels, which impart a to-and-fro motion to the centre bevel wheel M, whereby the carriage I is made to slide backwards or forwards. Each of these bevelled wheels is put in motion by pulleys, O O^1—the pulley O driving the wheel N, and the pulley O^1 the wheel N^1. A loose pulley P is placed between the pulleys O O^1, on to which the driving band is thrown, by means of a forked lever, while passing from one driving pulley to another. The framework Q, which carries these parts, is placed in front of the machine (as seen in the engravings, figs. 1, 2, and 4). A recess is hollowed out in the centre of the carriage I, and covered by a plate; in this recess a pinion *x* works, the axis of which projects out on both sides of the carriage, driving at one end (by means of a boss *k*) a rod which carries a grooving tool (to be hereinafter described), and at the other end working an index hand T, which registers its revolutions on a dial plate S, fixed in front of the

carriage. A toothed rack R passing through the recess (on the right-hand side) works the pinion *x*, and is set in motion (through studs at its lower end) by the inclined bar or lever E in the lateral grooves E^1, of which the studs on the lower end of the rack travel.

The inclined bar or lever E having been fixed by the sectors G G^1 in the position or at the degree of inclination desired (which, of course, will depend on the spiral twist intended to be given to the rifling), the carriage I is set in motion by the screw J, and carries with it the rack R, which, receiving an upward impulse from the inclined bar or lever E, imparts a rotary motion to the pinion, which determines the degree of twist to be obtained.

U is a moveable puppet, which slides along the table or bed A. A boss, V, is centred in this puppet. A passage large enough to admit the rod of the grooving-tool carrier, to be hereinafter described, is hollowed out through the boss V, and on the back end of the boss is a rectangular recess, which receives the muzzle of the barrel to be rifled, W, and which is held to the shaft of the boss by square-headed adjusting screws, working into metal wedges or blocks round the barrel. An adjusting screw, X, in the top of the puppet, keeps the boss in any particular position which may be requisite.

Fig. 13.

Fig. 20.

Fig. 19.

Fig. 18.

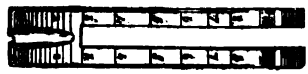
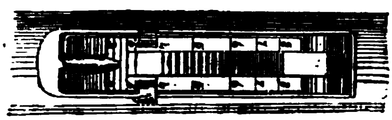


Fig. 12.



21*a*.

21.

Fig. 15

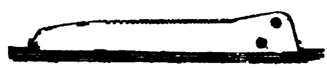
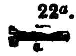


Fig. 17.

22*a*.



22*b*.

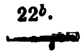
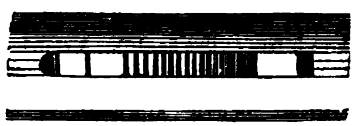
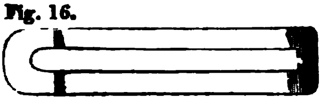


Fig. 14.



22.

Fig. 16.



Y is another puppet, constructed similarly to the puppet U, excepting that the boss Z of this puppet is turned in an opposite direction, so as to receive the breech of the barrel. This boss has a collar, furnished with teeth so arranged as to correspond with the degrees marking the spaces between the rifling; a paul takes into and stops the teeth.

A^1 is a third puppet, which is placed at the back end of the bed, and also provided with a boss carrying a dividor b^1, which revolves on its own axis, and can be stopped at pleasure by an adjusting screw *c*, as in the puppets before described. In the axis of this dividor is a square passage, through which slides a square rod *d*, the length of which should be at least two feet more than that of the barrel to be rifled. *e* is a boss with a moveable guide, having a square slot through which the rod *d* passes. This boss is carried by a bracket *f*, of the peculiar shape shown in the engraving, fig. 2, and serves to keep the rod *d* from vibrating; *g* is a rod held at its front end by a boss *h*, worked by the axis of the pinion of the carriage I. This rod should be a little longer than the barrel to be rifled. To the back end of this rod *g* is screwed a cylinder *i* of the same diameter as the barrel to be rifled. A top view of the cylinder *i* is shown in fig. 5—a horizontal section in fig. 6, and a section showing the internal arrangements in fig. 7. A rod *j* is screwed into the other end of the cylinder. At the end of the rod *j* (within the cylinder *i*) is a button, which takes into a split, socket, or cap *l*, where it is held by a screw. This socket carries an inclined or wedge-shaped piece *m*; all these parts are within the cylinder, as shown in fig. 7. The furthest end of the rod *j* is so contrived as to fit into the other end of the square rod *d*, where it is held by a screw.

o is a mortise or recess cut away in the cylinder to hold a grooving tool *n*, one end of which, o^2, is centred in a screw a^2, which passes through the cylinder. The to-and fro movement of the rod *j*, actuating the wedge-shaped piece *m*, lifts the grooving tool up and down as may be required. When the apparatus is ready to work, the barrel to be rifled, W, is passed through the bosses V and Z; and the rod *g* (which works the grooving tool) is inserted into the barrel by the muzzle, and comes out at the breech. The square rod *d* (actuated by the dividor b^1) works the rod *j*, which drives the lever or wedge-shaped piece *m* under the grooving tool *n*, thereby raising its cutting edge as much as the depth to be given to the commencement of the rifling may require.

The rod *g* is then drawn back by the carriage I, drawing the cutter with it, and by its peculiar elliptical motion, it gradually unscrews itself from the rod *j*, which is kept stationary by the square rod *d*, which follows the rod *g* without turning.

The reverse movement is produced when the cylinder is drawn towards the breech. The shavings from the barrel fall into the mortise *o*, which holds the grooving tool. It will easily be understood that this movement imparts to the rifling a diminishing progression precisely corresponding to the length of the barrel.

The advantages resulting from the construction of the machine, and the manner in which it works, are—

1st. That the rifling produced may be of any desired degree of twist in any required direction, and effected with mathematical precision.

2nd. That the rifling will be cylindrical, or in any degree of diminishing progression required.

3rd. That the process is much accelerated, and the rifling so perfectly accomplished, that when the barrel is withdrawn from the apparatus it will be quite smooth, and require no further finish.

Secondly. My invention consists in the improvements in sights or bridges represented in figs. 8, 8*a*, 8*h*, 9, 10, 11, 11*a*, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 22*a*, and 22*b* of the engravings annexed.

In rifled fire-arms, the sight is one of the most important accessories for securing the requisite precision of aim; and the more simple its construction, the better will it answer its purpose. A sight, moreover, should be made sufficiently strong to resist any shock, blow, or accident to which it might be exposed, so that the fire-arm may not be deprived of this important appendage in critical moments.

A sight applied to a pistol is shown in fig. 8, fig. 8*a*, fig. 8*b*, fig. 9, and fig. 10. Here, in order to avoid taking up too much space in the barrel, the moveable plate is placed vertically; it takes into and is free to slide up and down in a groove cut in the tail-piece of the breech (see section fig. 10). A clutch spring, shown detached in fig. 11 (plan), and fig. 11*a* (side view) keeps the plate in the required position, for showing the distance to be reached. In order to simplify the movement of the plate, when the marksman fires point blank, a "pusher" or piston with projecting top is placed in front of the trigger-guard, and through the trigger-piece. This "pusher" when pressed by the finger, raises the moveable plate at pleasure; and when the top of the plate is once released, and leaves its original position, it can easily be raised by the thumb and finger to the top of its range. By this arrangement the pistol will hit at distances of 400 or 500 yards. And, at the same time, the sight is so contrived as not to incumber the barrel.

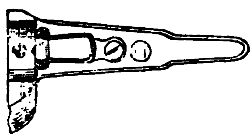
The advantages of this plan are:—That the sight is all in one piece. That it presents only *one* sight-piece, or notch, which may be raised or lowered with mathematical accuracy, and to the required degree (showing the distance to which the projectile is to be sent), where it will remain quite stationary; and is, moreover, of simple yet particularly solid construction.

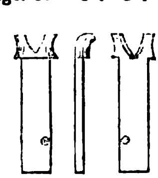
Another of my improved sights which is represented in fig. 12 (a plan), and fig. 13 (side view) is constructed in the following manner. An iron or steel bridge, shown in fig. 14 (plan), and fig. 15 (side view), is soldered to the barrel at such a distance from the breech as may be determined by the line of sight. The top of the bridge is notched, so as to mark the proper graduations of the range of the fire-arm. There are three holes in the bridge. To this bridge is fitted a steel spring split lengthwise, so as to clutch the bridge; this spring (a plan of which is shown in fig. 16, and a side view in fig. 17), is strengthened at bottom, and tapers gradually towards the end, so as to facilitate its action, it is fastened at the back of the bridge by a pin *d* (fig. 22*a*). A moveable steel plate of the peculiar forked-form shown in plan (fig. 18, in section fig. 19, and back view fig. 20), and curved according to the maximum elevation to be given to the sight for the longest distance, clutches the bridge; each of the legs of this plate terminates in a loop or eye; one of these eyes is smooth inside, and slightly enlarged, so as to receive the head and neck of a screw, which passes

through the other eye (the inside of which is threaded), and then into the uppermost of two holes in the bridge, where it serves as a pivot on which the plate rests. The lower of these holes is intended to receive (when requisite) a pin, which stops the play of the spring, and allows the screw to be taken out and the moveable plate to be unshipped.

The legs of the plate are graduated to show the different distances of the range, and the plate is kept in the required position by means of an index slide with a spur point (shown in plan fig. 21, and side-view, fig. 21*a*,) which takes into the notches on the bridge, corresponding to the graduations on the plate. A screw *a* at the top of the plate (shown at figs. 22, 22*a*, 22*b*,) acts as a stop to the slide. At the end of the plate is a sight notch which serves for all distances. When firing point blank, the plate rests on the middle of the legs of the spring, where it is held by the spring. When it is desired to fire at a greater distance, all that has to be done is to raise the plate, and push the slide towards the mark on the scale, showing the distance in question, whereupon the spur-point of the slide will catch into the corresponding notch on the bridge, where it will be kept by the pressure of the spring. The advantage of this sight is that it takes to pieces, is of simple construction, and may be handled by any one even in the very coldest weather.

Fig. 9. Figs. 8. 8*a*. 8*b*. Fig. 10.





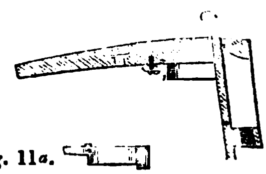
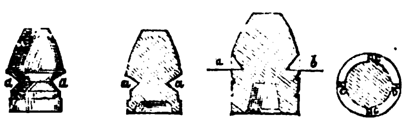
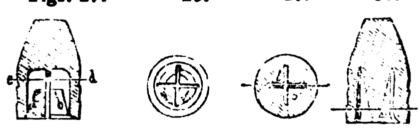


Fig. 11. Fig. 11*a*.

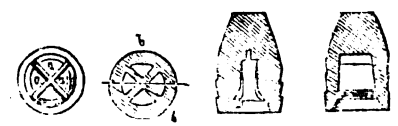
Figs. 23. 24. 25. 26.



Figs. 27. 28. 29. 30.



Figs. 31. 32. 33. 34.



Thirdly. My improvements relate to the manufacture of projectiles acting by the expansion of gases resulting from the explosion of the powder employed; and are represented in figs. 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, and 34, of the engravings. Fig. 23 is a side view, and fig. 24 a vertical section of one of these projectiles, which I call the throat ball. It is made in one piece, and is slightly hollowed out at back, in order to receive and concentrate the action of the gases. In front, it is of the form represented in the figures. Round this projectile is an angular groove, furrow, or recess *aa*. The gases concentrated behind it act directly and instantaneously on its base, which, not finding any resistance, owing to the peculiar position of the angular recess *aa*, collapses (lengthwise), and the two sides of the angle, in righting themselves, expand and enlarge the perimeter of the ball, so as to let it take into the groove of the rifling.

The ball being solid, and not having any opening into its centre, which might disturb its equilibrium, will not lose its shape before firing, nor splinter while firing, and its effects will be found identical. A modification of this projectile adapted for military, or such other

fire-arms as are loaded by cartridges, is shown in fig. 25 (vertical section), and fig. 26 (horizontal section on the line *ab* of fig. 25). Here the object in view is to remedy the inconvenience which might arise from the paper of the cartridge getting entangled in the grooves of the ball when it collapses. *c c c c* are four slender longitudinal ribs in the throat or recess which serve to hold up the cartridge-paper, and prevent it from creasing and being entangled in the recess; the ribs collapse, of course, with the rest of the projectile. As a greater expansion of the ball is necessary when it is employed for military purposes, the hollow at the back of the ball should also be made deeper, but not so deep as to reach the centre. Fig. 27 is a vertical section of another projectile, which I call the crosial hollow ball. Fig. 28 is a bottom plan, and fig. 29 a section on the line *c d* of fig. 27. This ball is hollowed out at back to about one third of its height; the recess or cavity *a* thus formed, which is shaped like the frustrum of a cone, serves to concentrate the gases. At the bottom of this recess are two slots *b b* (fig. 29) which cross one another at right angles, so as to form a cross as shown; these slots begin at the bottom of the recess *a*, and reach to the centre of the ball. The effect of this arrangement is that greater solidity is imparted to the projectile while at the same time, the sides being more slender at the bottom of the slots *c c c*, the action of the gases compressed in these slots expands the ball throughout its cylindrical part, and the ball takes into the grooves with much regularity, and without danger of its being cracked or splintered, while its thickness prevents any likelihood of its losing its shape.

Fig. 30 is a vertical section, fig. 31 an end view, and fig. 32 a cross section of another projectile, of an elongated form, which I call the cellular ball. At the back there is a recess which extends beyond the cylindrical part, and is divided by two partitions *aa* crossing one another (as shown in the section), thus forming four distinct compartments or cells *b b b b*. These partitions gradually increase in thickness towards the bottom of the recess, so as to impart a sharp-pointed shape to the compartment (see fig. 30). The effects of this arrangement are:—Firstly, That although the outer sides of the ball are not very thick (and the ball, therefore, more easily expands), they are, however, supported by the four interior partitions, and consequently keep their shape. Secondly, The gases entering a deep space, which is very wide at its base and narrow at its apex, are considerably compressed at the centre of the ball, and (taking as a fulcrum the nucleus formed by the thicker parts of the interior partitions) they force the outer sides, which are thinner, to expand in the grooves of the barrel.

Figs. 33 and 34 are sections of another of my improved projectiles, which I call the cylindrico-flat-hollow ball. The hollow of this ball is circular from its base to about the eighth of an inch upwards, when, by means of two parallel curves, it changes into a flat and slightly conical form, and terminates at top in a slot, as shown in the engraving. The objects here are to enable the sides of the ball to maintain a strong resistance; to have a wide opening for the ready admission of the gases, and to compress them gradually up to the centre of the projectile, so as to effect the requisite expansion without splintering or distorting the ball. The general result of these improvements, before described, is to simplify the construction of fire-arms where precision is an object; to dispense with the necessity of expanding the ball in the rifling before firing; to allow of the ball being withdrawn from the barrel by an ordinary worm-screw; to do away with the employment of expensive appendages in using rifle fire-arms; to simplify and accelerate rifle firing, and afford convenient means of rendering this description of fire-arms accurate and efficient while retaining their simplicity of construction and rapidity of discharge. It is proper to observe that such arrangements as tend to permit of the projectile being made in one piece, to render it strong, and to prevent its splintering and becoming distorted, are among the most effectual means of arriving at perfection in the use of fire-arms.

INDUSTRIAL SCHOOLS FOR WIVES.

Sir,—The inclosed observations may seem more suitable for some tract on education than for the *Mechanics' Magazine*; but so long as young machinists and manufacturers allow themselves to be smitten by theshowy rather than the useful, so long parents will give their daughters the kind of frivolous training which, at the present day, is most likely to obtain husbands for them; it is, therefore, with young men that the reform of female education must begin in the middle ranksof life, and it may not be useless to draw their attention to the qualifications which render a wife the economical as well as the agreeable helpmate of the man whose prosperity depends so materially upon her exertions.

I am, Sir, yours, &c.,

M. S. B.

"Wanted, in a *tradesman's* family, a governess who can teach music," was the other day amongst advertisements in the *Times*, no other qualification being specified as desirable than that of teaching *music*, though the governess sought for was to educate a *tradesman's* children. This indicates the kind of acquirements constituting the education which tradesmen now give their daughters, as also fathers of many other denominations considered as superior to the operative, but yet whose incomes barely suffice to furnish the accommodations and appearances expected from persons in their station of life—say having incomes amounting from two or three to eight or nine hundred a year.

Now what are the prospects of the daughters of such persons? Either to subsist after the father's death on the pittance he has been able to lay by for them, or, more happily, that of marrying men in their own sphere of life, young men, probably, but newly established in their respective occupations, and hoping to find a helpmate that will second endeavours to make their present income go far in furnishing comforts, and even to lay up the shillings and the pounds which, in addition to skill and application, may be requisite for establishing them in superior positions.

What are the requisites in such a wife? Surely not the elaborate vocal performance of the opera *prima donna*, nor the laboriously acquired touch of the professional pianist; for such a knowledge of domestic concerns as shall enable necessaries to be provided with economy, and prevent waste of them when obtained.

The father of a family may sometimes be given to costly indulgences, but usually the greater part of a man's disbursements are committed to the wife's care; she has the choice and management of servants, the purchase of provisions, clothing, and furniture; the keeping the whole in repair depends upon her vigilance; and the daily comfort of her husband on her so arranging matters as that, when he is at home, he shall never be annoyed by her being at those times engaged in any domestic occupation that deprives him of her society and attentions. She should not be the "square-elbowed family drudge," but the rational companion of her husband's leisure hours; she can read to him, enter into his pursuits; if she can sing, and accompany her cheerful voice on the piano, all the better, so that too much time be not consumed in keeping up her skill in *easy* music; and in all mechanical and artistic professions her pencil might assist the man in realising his perceptions of improvement. Happily, there are still many mothers who early initiate their daughters in the several branches of domestic economy on which good management depends, without depriving girls of those accomplishments which fill up agreeably spare minutes or hours; but yet the general education given to daughters of the middle ranks of life is that of mere, and often frivolous, accomplishments.

It would require a new creation of schools and of private governesses to render them competent to the affording appropriate education to girls of the middle classes, as the habit of despising homely knowledge has become so prevalent as to have rendered most young mothers unable themselves to give their children an insight to domestic matters. Industrial schools for young ladies of the highest rank did exist in Edinburgh little more than a century ago, and might be introduced with great advantage in many large British towns. The pastry and the clear-starching schools in Edinburgh were as regularly attended as was the dancing-school, by all young ladies coming to that metropolis to finish their education. In those schools young women, intended for superior servants, were instructed in the afternoon, their mornings being passed in attendance on the ladies,—that is, to fetch and carry for them, to clear away rejected matters; but the actual making of cakes and pastry, and the clear-starching and ironing was done by the ladies' own hands.

The *industrial* education of young *ladies*—for this term of *industrial* seems the only appropriate one—is so novel that it seems to require much detail for its illustration. Elementary instruction in reading and writing, now so general in Infant-schools for the poor, does not appear to be made so useful as it might be to the young lady by rendering it subservient to *useful* knowledge. There are no short lessons or tales to interest the little girl about the materials requisite for articles in which she takes

a pleasure, such as that the pincushion she wishes to make would require so much silk or ribbon, so much sewing silk, and such and such materials for stuffing, and they would cost so much money — can she afford to buy all this? and so of the doll's dress or the baby's frock. There are no sums in arithmetic that descend to such trivialities; but it is by suiting lessons to the wants, desires, and comprehension of a child, that its attention is pleasurably engaged; and instruction of all kinds should, where practicable, be made a pleasure, not a pain. So the value of money might be early inculcated by lessons in arithmetic:—"Mamma gives me sixpence a week, what can I buy with it?"—So and so. "I should like to purchase this or that, it will cost so much; how many weeks must I lay by my sixpences to make up the sum?" Thus the girl might be led, step by step, to estimate the expenditure of a family in the enjoyment of different incomes. The machinist, the architect, the engineer, habitually estimate the cost of works they have to propose, few of them extend to housekeeping — this useful preliminary step to good management—still less their wives; yet it is essential to living within ones income; and in such estimates the item of *contingencies* needs to be set down at a high figure.

Plain needlework has of late years been much neglected, but neatness of the plain seam or hem, and quickness of its execution, are, in fact, the only good foundation for all fancy or other works of the needle. Many governesses and school-mistresses are perfectly competent to afford this species of instruction; few, however, to teach the very important art of *repairing* apparel, and of the few who know how it should be done, not many like the trouble of teaching it. That it should be taught is, notwithstanding, essential. The mending properly different articles of dress or furniture depends not only on their intrinsic value as compensating for the time bestowed upon them, but also on the nature of the fabric. It may seem absurd to *class* such a homely concern as mending. —yet what is classification but sorting works like things, so as to put each kind together that requires the same description of operation? This sorting, as applicable to repairing apparel, brings it under the general heads of patching, darning, supplying deficiencies in the original form of texture.

To patch—how almost vulgar is the term! Yet it is an operation requiring far more skill than does the making a new garment, and, when well executed, may save the purchase of many a costly one; the most expensive robe may by accident be torn, or spotted, the first day of its wear; the piece inserted in lieu of the damaged one is a patch. If a figured material, the pattern has to be exactly matched; in all cases the insertion must be made without pucker, and the kind of seam be such as, though strong, will be least apparent, the corners must be turned with neatness. Is not this an art which requires teaching? So of darning, much instruction is necessary as to the number of threads to be left by the needle according to the kind of fabric; then there is the kind of thread or yarn most suitable, which requires experience to determine; where the article is coarse, the chief attention is directed to expedition, but a costly article of embroidery on muslin can only be well darned with ravellings of a similar muslin; such particulars do not come to the girl by inspiration, they must be *taught*, or left to be acquired by dearly-bought experience. The third mode of repair is well understood and practised by our Continental neighbours, though rarely in this country. The stocking stitch is neither more difficult nor tedious than the darn, yet how many pairs of stockings are lost for want of knowing it when a hole happens to be above-shoe? Practice in lace stitches is still more desirable, particularly for repairing lace of the more costly descriptions. The deficiency of a single loop, when lace is sent to be washed, often becomes a large hole during the operation, and thus the beauty of the lace is destroyed. Indeed, lace when duly mended on the appearance of even the smallest crack may with little trouble be made to last twice or thrice the usual term of its duration. So the shawl stitch is never taught in this country, though by employing it with ravellings from the shawl itself, the most costly cashmere can be repaired without a possibility of discovering the inserted part. Proficiency in such *useful* works might well merit as much approbation as is now

bestowed upon crochet or other fancy works, and might be considered as equally desirable qualifications in a tradesman's governess as music. In populous places, it might well answer to establish schools where the art of mending apparel should be the chief object of instruction; a month or two spent in it might be sufficient for the damsel, already a good plain needle-worker. It must farther be observed that without a practical knowledge of needlework no young lady can judge whether her servant has or has not done a reasonable quantity of it in a given time; and if this be true as to the plain seam, it is still more essential in regard to mending of all kinds.

Farther; millinery and dressmaking should be amongst the arts in which young ladies should be instructed. *Taste* is acquirable in a great degree, though it be generally regarded as an in-born gift. The blending of colours agreeably is reducible to certain rules; the suiting dress to age, form, and complexion can, to a certain extent, be taught; but without aspiring to the taste of a first-rate *modiste*, every girl may be taught how to trim prettily her ordinary cap or bonnet, to put new sleeves to her gown, or to make all but the nicer parts of a new one, calling in a mantua-maker by the day to cut and fit the more difficult ones, thus saving perhaps half the cost of a similar article if furnished by the milliner.

Cookery is another domestic acquirement now almost entirely neglected in the middle ranks of life, yet ignorance of it is one of the most frequent causes of extravagance and waste in household management. Now-a days the mistress rarely knows the average quantity of meat or bread the healthy man, woman, or child requires for sustenance; she knows not the ingredients, or the quantities of them, requisite for the confection of a tart or pudding, or what condiments or sauces will give relish to the dish made up from the yesterday's remains, or what is necessary for the composition of some little nice made-dish, as it is called; she is therefore wholly dependent on her cook in point of expense, or, if not rich enough to have one, can only feed her husband one day on the joint ill-roasted by her girl of-all-work, the next day on its cold remains. Why should not the Edinburgh pastry schools be imitated in large English towns? Such schools might not be frequented by young ladies of rank or great hereditary wealth, but it is now a question of the middle-classes, whose incomes are limited to a comparatively small amount, and of the daughters of all descriptions of persons who, without being wealthy, rank above the operative.

In London, confectioners and pastry-cooks also prepare soups and what are termed made-dishes; this renders a confectioner's laboratory a most desirable place for acquiring the art of good cookery, and it would not be difficult to arrange matters so as that young ladies might become his pupils. The instructor is here supposed to be a man, because the custom is to consider men as the best cooks; though, in fact, there are women, not a few, of equal proficiency in the art, and there can be no good reason for depriving them of this means of obtaining superior incomes and consideration. Be that as it may, a female of respectability must, of necessity, be the presiding personage in every school for young ladies, and be always present during their lessons.

The first lessons in the art of cookery would, in fact, be chemical. Liebig particularly has demonstrated the principles on which the extraction of the juices of meat depends, and those by which the retention within it of succulence and flavour is obtained. So due fermentation, of which lightness of bread and cakes is the result, is purely chemical. An elementary book on these and similar subjects is much wanted; the best of cookery-books are altogether deficient in this kind of instruction; they may go so far as to say "stew it gently," and "leave it to rise, then bake of a nice light brown," and the knack of so doing is often acquired by practice; but the mistress of a family should know the *principles* on which excellence in cookery depends, and thus be enabled with little practice herself to tell her servant how to amend her ways.

A good foundation of principles being laid, the next requisite is practical manipulation; this would be easily acquired in the school, in so far as to enable a mistress either to make the tarts herself or to direct her servant. Some little modification of the usual confectioners'

kitchen and laboratory would be required for a school, as confectioners' cooks operate on large quantities—private families on small ones. A long dresser would be necessary, proportioned to the number of learners; a hot plate, with apertures for the insertion of small sauce and stew-pans, and an oven; these, with a provision of moulds and cutters, and some other kitchen utensils, would form the fittings of the school: the materials to be operated upon might best be paid for by the pupils, they taking the produce home in proof of their skill. The several materials would be best provided by the master, and might be charged to the pupil according to a certain tariff. With a view to making much use of a few fittings, the pupils might attend in succession, taking their lessons only once or twice a week; attendance on them might be, as it was in Edinburgh, by servant learners giving their time as payment for instruction.

The difficulty in London of washing and getting-up large linen well, has caused the very general practice of sending it to be cleansed by suburban laundresses. It is a costly usage, as these persons are tempted to employ soda, lime, and bleaching liquor in destructive quantities; still, muslins, laces, baby-linen, and other small articles, are generally washed at home. Sometimes servants do this business well and carefully, but, generally speaking, it is only highly paid ones who are competent to it, such as lady's-maids and regular laundresses. The mistress should be competent to instruct a young or a low-waged servant in the mystery of washing, starching, clearing, and ironing of muslins and lace, at least. Indeed, the wear and tear of fine muslins and lace in washing is so great when done by incompetent hands, that the mistress of confined income would be well repaid for her trouble were she to take this business on herself: it is neither dirty, laborious, nor disagreeable. But young mothers have now, generally speaking, so very little knowledge of this kind, that here again for the present recourse must be had to school teaching—to a clear-starching school, as formerly in Edinburgh.

Attendance of ladies on the sick has of late become the fashion, but it is rather of the wealthy on the very poor than of invalids in the lady's own family. To administer to the wants of the diseased is always laudable, but is most valuable in the home circle, and there most conducive to the restoration of health, or to the allaying the pains of illness or of dissolution. There are in print many good instructions for the management of the sick chamber which might be consulted with profit; but tender attentions are neither of school or book teaching; it is the mother of the family who must herself instil the affection which induces them.

Scores of school and governess advertisements have been looked over; those schools where the fee is so low as £20 a year for board, lodging, washing, and instruction, all profess to teach the pupils French, drawing, music, dancing, but not any one of them gives the slightest indication that any domestic knowledge will be imparted. It is the same in regard to governesses; not any one of them notices any instruction as to be given for rendering pupils good economists, or suitable wives for men of moderate incomes.

Let it not be conceived that knowledge in homely concerns either destroys beauty or renders a woman less able to shine in society, or to attain distinction in the higher branches of literature. Examples abound of a combination of great beauty and talents with the knowledge and practice of domestic concerns. Amongst many other instances, one lovely woman devoted her early morning hours to the education of her children, later in the day to her own instruction in what most interested her husband, a gentleman of high standing in the legal profession; another lady of rank, so beautiful as to draw admiring crowds around her, without impairing her charms, taught a poor cousin how to wash and iron soiled ribbons. The authoress the most distinguished of the last half century in the higher branches of poetic lore, could, and did, to an advanced age, make and mend all articles of dress, and was remarkable for the neatness, propriety, and fashion of all she wore; she herself trained her servants in their respective duties, and, on a small income, rendered her house and table models of comfort and of ladylike propriety. A lady historian can make a pudding, and does so when there is occasion for it: the woman who ranks with men of profound know-

ledge in abstruse science, whether as an authoress or in society, is a clever artist with her pencil also, yet is no less an adept in every domestic occupation.

HORSE GUNS.

Fig. 3.

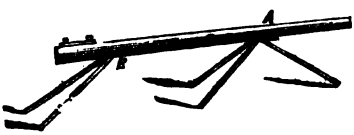


Fig. 2.

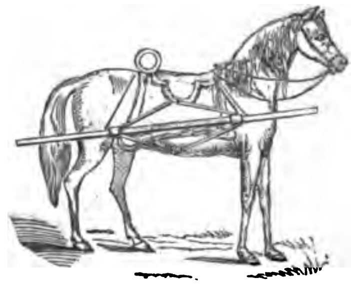
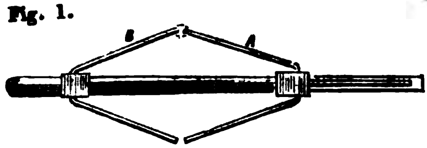


Fig. 1.



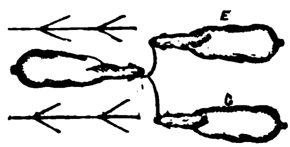


Fig. 4.

Sir,—I have often thought that a weapon might be effectually employed in modern warfare intermediate between the musket carried by a man and the cannon moved on wheels.

Suppose we have a long duck-gun barrel, rifled and constructed to load at the breach, carrying a minie ball and accurately sighted. Now, if this formidable arm could be slung on a strong horse, so that a man could also ride, we should have at once an addition to our forces, both economical and effective.

I propose that the barrel be about 10 feet long, and 1¼ inch bore, or say shorter, and of greater calibre, if such is found preferable.

There should be two legs, hinged at A (fig. 3), but not free to approach each other, and a third leg (also hinged) should fold up *forward* when the gun has to be "horsed."

The triangle, B, is near the breach, and the gun turns horizontally at A, so that it could readily be pointed.

I would keep the barrel within 2 feet of the ground, to secure as much steadiness as possible, and this would cause the artilleryman to stoop in pointing, which would be so much in his favour. The only question is, whether any system of temporary support would resist the recoil, without being overturned? From observing the action of duck-guns, I have no doubt that the plan now proposed would answer the purpose.

Fig. 1, shows the gun "stowed away," or packed up; Fig. 2, shows its position on a horse; Fig. 3, represents the gun lifted from its slings and placed on the ground ready for firing.

In fig. 4, I have indicated three horses, E, F, G. Of these, E and G carry guns, and F the ammunition (or *additional* ammunition). This sort of cavalry are supposed to advance in "threes," as above, and as each man dismounts, the rider of F, turning his horse round, stands at the head of the three horses and fastens them together. He then supplies his comrades on either side with ball-cartridge, and at the order "cease firing," assists each of them to "horse" his gun.

A gun of this description would carry a ball at least two miles, and a troop of sixty men would be armed with forty guns. If heavy artillery-horses were used, they could trot under their burden; and many other advantages will occur to those who see in every improvement of our weapons of war a further guarantee of our present state of peace. Yours, &c.,

JOHN MACGREGOR.

WASHHOUSES ON BOARD EMIGRANT SHIPS.

Washhouses are amongst the many comforts Mrs. Chisholm has introduced in her emigrant vessels; she finds by this innovation the outfit of an emigrant may be reduced from six to two pairs of stockings; and so of all other articles of under-clothing,—thus affording much benefit to emigrants of scanty means.

But, however great the advantages of washhouses in a pecuniary point of view, they are far surpassed by sanatary considerations, on which account alone it would seem advisable that washhouses should be generally introduced in *all* passenger vessels

By the time a vessel lands her passengers in Australia, every one of them will have used five of their six articles of under-clothing; whether the soiled linen may have been stowed away in the hold, or in or about the berths, its deleterious emanations must necessarily be diffused throughout the interior of the ship. For every 100 passengers, 500 pairs of dirty stockings! What would be the consequence of such an accumulation in any house on land? That it is not a continual source of contagion at sea can only arise from the purity of an oceanic atmosphere, but that it does contribute to sea-sickness and other disorders is not to be doubted.

The Colonial Land and Emigration Commissioners direct that on board of their ships the commander is to fix upon two days in the week for washing. But in two days it is not possible for hundreds of emigrants to properly cleanse their soiled garments without appropriate apparatus, besides that where there are not washhouses, washing cannot be otherwise than a general annoyance to both passengers and ship's company, and often a hindrance to the general evolutions and business of the vessel. With well-contrived apparatus washing might be carried on for ten hours of every day without interference with others than the washers. Ten hours daily, give sixty hours weekly; consequently, *one single* washing-place would afford an hour's accommodation every week to sixty passengers,—time enough for any one to wash their linen of a week's wear, and marine soap enables sea water to suffice for the operation. It is by a *succession* of washers, not by fixed washing days, that the tubs in public washhouses are made to afford such ample returns.

The centrifugal *drying*-machines, which so well answer the purpose on shore, would be still more advantageous on board ship, since during wet or foggy weather linen cannot dry in the open air; besides that at all times the suspending clothing to dry is disagreeable, and occasionally may impede the progress of the vessel.

An apparatus might be easily contrived that should complete the drying of linen by means of the waste heat from the cooking fires. A drying closet might be enclosed where most out of the way near the cooking-apparatus; there was such an one in the year 1797, on board the *Arrow* for drying seamens' clothing. A rapid current of warm air might be forced through the drying-closet by a very simple blowing-machine easily worked by hand.

M. S. B.

HARBOUR IMPROVEMENTS.

Eminent engineers, half a century ago, having been of opinion that the embankment of mud-lands, though only overflowed at spring tides, was injurious to harbours, and therefore opposed many of Sir Samuel Bentham's plans for their improvement, he was led, from time to time, to note down his ideas on the subject; and, amongst his papers, endorsed "Harbour Improvements," the following scrap has just been found:

Those to whom the decision is generally left as to different plans for the improvement of harbours, are usually little in the habit of scientific investigations respecting them, and have rarely time for the requisite inquiries; hence the proneness to adopt some general theory which may enable them to determine readily with some appearance of reason on their side. Hence, all being agreed that, by the motion of water, soil is carried away, it is readily admitted that the more water there is in a harbour, the greater will be its effect in carrying away soil from the bottom. It is from this notion that all projections of land into the water are condemned, as also embankments of those parts which are dry, excepting at high water. As, however, wharfs are very useful, the acquisition of valuable land desirable, and, on sanitory considerations, the doing away with offensive mud and marshes, it is to be regretted that a more general knowledge has

not been acquired of the real effect which running water has on the soil below it.

When the object is to clear a harbour from mud, sand, or from soil of any kind that is acted upon and set in motion by a superincumbent current of water, it is necessary to follow up the motion of that soil from the first place at which it is set in motion to that place where it is desirable it should be deposited, or carried into the general bed of the ocean.

In considering the power of water to raise soil and continue it in motion, it is not sufficient to ascertain the velocity with which the water runs at its surface and in the middle of the stream, nor is it enough to ascertain the velocity with which the water moves against the soil as sufficient to show its power to remove obstacles, since that power will not be in proportion simply to the velocity, but also to depth as well as velocity;—hence the question of velocity multiplied by the depth of water.

To judge of the velocity with which the water strikes the soil, it is necessary to distinguish the position of the soil acted upon, the velocity of the water when striking the soil in that position, and the height of the superincumbent water which has to be raised for the water to pass; in other words, the depth of the water at that place.

To follow up the soil from the first of its being set in motion, to consider the several causes of acceleration or retardation of motion, as well as the resistance and depths, requires close attention, much discernment, and circumspection. To form any well-grounded opinion on the causes of the different depths in harbours, or on the means of improving them, it is necessary to consider the velocity and depths of the water under different circumstances of wind and times of tide, the specific gravity of the different soils the water has to act upon, such as mud, sand, clay, shingle, stones—in as far as regards their facility of being removed or suspended, and then to follow up every portion of soil supposed to be acted upon, until it be supposed to be deposited where desired, or entirely carried away.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING AUGUST 1, 1852.

THOMAS RICHARDSON, of Newcastle-upon-Tyne. *For improvements in the manufacture of magnesia and some of its salts.* Patent dated January 23, 1852.

The *first* branch of this invention consists in the manufacture of magnesia and the carbonate thereof from magnesian limestone, by the employment of muriatic acid. The quantity of acid used should be slightly in excess of the exact quantity required to dissolve out the lime in the limestone operated on. This may either be burnt to expel the carbonic acid and then slacked in pits previous to adding the muriatic acid, or it may be employed in the natural state reduced to an impalpable powder,—the product in the former case being magnesia, and in the latter an impure carbonate; which may either be employed as such, or be deprived of its carbonic acid by the application of heat. The acid employed by the patentee is (by preference) the weak muriatic acid, which is at present allowed to run to waste in alkali works, and the proportions of it used are, a quantity containing about 37 parts of pure muriatic acid to every 28 parts of lime in the burnt magnesian limestone, and the same for every fifty parts of carbonate of lime in the unburnt stone.

The *second* part of the invention has relation to the employment of magnesia, obtained as aforesaid, in the manufacture of some of the salts thereof.

1. In order to increase the production of what are known as "rough epsoms" in the alum trade, the patentee proposes to use magnesia freed of lime by muriatic acid, as aforesaid, instead of the magnesian limestone ordinarily used.

2. In order to produce sulphate of magnesia when manufacturing alum, the patentee adds to the alum liquors (which always contain an excess of acid) a sufficient quantity of magnesia obtained as aforesaid, to nearly saturate the excess of acid. He then proceeds to manufacture the alum in the usual way, and obtains the sulphate of magnesia by subsequently evaporating the residual liquors.

3. The patentee proposes to use magnesia obtained as aforesaid, in purifying "rough epsoms." In this case he adds a small quantity of vegetable or animal charcoal, in order to prevent the formation of ferric, or manganic acids. In other respects the process is the same as usual.

4. Another use to which the patentee applies magnesia obtained by his process, is to the purification of "rough epsoms" by calcination.

5. Another improvement consists in producing sulphate of magnesia from sulphate of iron or copperas waters. The patentee precipitates the iron from such solutions by the addition of magnesia obtained as aforesaid, obtaining the iron in the state of oxide, and the sulphate of magnesia by evaporating the remaining liquors. A small quantity of charcoal is also added in this process.

6. When manufacturing salts of soda, according to Mr. Ward's process, the patentee proposes to employ the carbonate of magnesia obtained by his process, instead of the native carbonates as claimed by Mr. Ward.

7. The patentee manufactures carbonate of magnesia by causing a stream of carbonic acid to be forced through vessels containing magnesia obtained as aforesaid, diffused through water. A bicarbonate is thus produced which enters into solution with the water, and this is consequently converted to carbonate, which is obtained as a precipitate by the application of gentle heat to the vessel containing the solution of bicarbonate.

8. The patentee proposes to employ magnesia obtained by his process in the manufacture of chloride of magnesia. The process is in other respects the same as usual.

Claims.—1. The mode described of manufacturing magnesia.

2. The means described of manufacturing salts thereof.

George Kent, of the Strand. *For certain improvements in apparatus for sifting cinders, and in apparatus for cleaning knives.* Patent dated January 24, 1852.

The "apparatus for sifting cinders" consists of a perforated cylinder placed in an inclined position, and through which, while in motion, the cinders to be sifted are caused to pass. The larger portions are delivered into a receptacle at the lower end of the cylinder, while the dust and waste pass through the perforations into a receiver placed beneath. The cylinder is supported on rollers at each end, and one end has a ring of teeth formed on it, into which gears a pinion set in motion by a winch handle, to which the power is applied. This arrangement admits of a central shaft to the cylinder, which would obstruct the free passage of the cinders, being dispensed with. The interior of the cylinder so furnished with several rows of projecting arms, for more effectually operating on the cinders.

The "improvements in apparatus for cleaning knives," consist in supporting the strips of leather of the cleaning discs of the patentee's patent machine by means of an elastic medium (by preference vulcanized India-rubber), instead of on rows of bristles as usual.

Claims.—1. The mode described of arranging apparatus for sifting cinders.

2. The application of India-rubber as a supporting means to the strips of leather employed to clean and polish knives in machines such as referred to.

Alfred Richard Corpe, of Kensington, gentleman. *For improvements in trouser-strap fasteners.* Patent dated January 24, 1852.

The ends of the straps have attached to them hook-shaped pieces of metal, which take into slots formed in other pieces of metal attached to the inside of the trousers where the strap buttons are usually sewn on. The extreme ends of the hook-shaped pieces are of greater width than the other parts of the hook, and the upper ends of the slots in the pieces of metal attached to the trousers are enlarged, to admit of the enlarged ends of the hooks passing therein. The purpose of the enlargement on the end of the hooks is to prevent the same slipping out of the slots, and to hold the straps securely.

Joseph Jones, of Bilston, Stafford, furnace builder. *For an improvement or improvements in furnaces used in the manufacture of iron.* Patent dated Jan. 24, 1852.

Claims.—1. The use of water or other liquid or solution, applied in troughs fixed near the flue jamb-plates, bridge jamb-plates, and back wall-plates of single puddling, boiling, or heating furnaces, and also in a tank or tanks, under the bottom plate of such furnaces, for the purpose of cooling and preserving the inside plates of the same.

2. The use of water or other liquid or solution applied in troughs near the flue jamb-plates, bridge jamb-plates, and partitions of double puddling furnaces, for the purpose of cooling and preserving the inside plates of the same.

3. The use of a flue for carrying off the heated air, sparks and products of combustion, from a refinery furnace.

4. The economization of the heat from a refinery furnace, by passing the heated air from the same through the flues of, or around a steam boiler.

5. The use of water or other liquid or solution, applied in a trough or troughs to the doors of furnaces used in the manufacture of iron for the purpose of cooling and preserving the same.

6. The use of water or other liquid, or solution, conveyed in a trough or troughs into the slide dampers employed in furnaces used in the manufacture of iron, for the purpose of cooling and preserving the same.

John Hinks, of Birmingham, manufacturer, and Eugene Nicolle, also of Birmingham. *For certain improved machinery to be used in the manufacture of nails, rivets, bolts or pins, and screw blanks.* Patent dated January 24, 1852.

The improvements claimed under this patent are—

1. A method of feeding or supplying

metal rods to machines for making nails, bolts, rivets, and screw blanks.

2. A method of tapering the metal rods of which nails are to be composed, by causing them to pass between rolling surfaces, the axes of which are at the same time caused gradually to approach each other.

3. A method of cutting or separating the partially-formed nails, rivets, or screw blanks, by causing the cutting or dividing tools to approach each other by the action of a screw, the thread of which is partly right and partly left-handed; and also, the application of the same method of giving motion to the dies, by which the partially-formed nails, rivets, or screw blanks are held during the action of the heading dies.

JAMES GATHERCOLE, of Eltham, envelope manufacturer. *For improvements in the manufacture and ornamenting of envelopes, part of which improvements are applicable to other descriptions of stationery; and in the machinery apparatus, or means to be used therein.* Patent dated January 24, 1852.

This invention has relation to the manufacture of envelopes and paper bags; the machinery employed is of too complex a nature to be properly described without the aid of drawings. The principal novelty appears to be the dispensing with a folding box, and supporting the envelope blank on an elastic surface while the pressure by which the flaps are turned up is applied, and in combination therewith, the application of adhesive cement in a dry or powdered state to the previously-moistened flaps.

WILLIAM PIDDING, of the Strand, gentleman. *For improvements in the manufacture, preparation, and combination of materials or substances for the production of fuel, and for other useful purposes to which natural coal can be applied.* Patent dated January 24, 1852.

The *first* part of this invention consists in manufacturing artificial fuel by combining small coal with coke, charcoal, peat, turf, brewers' grains, sawdust, roots, branches and leaves of plants, &c., or by saturating coke with a solution of nitre, or by forcing into the pores thereof oleaginous, resinous, or bituminous matters.

The *second* part of the invention consists in forcing into the pores of coke powdered coke, charcoal, or coal, then pulverizing the mass after submitting it to carbonization, and again carbonizing it after compression into moulds of the exact shape of the article to be produced. This composition may be applied to the production of building materials, to the manufacture of articles of furniture, and such articles as are usually made of stoneware or earthenware, to the manufacture of book-covers, sounding-boards for pianofortes, &c.

Claims.—1. The various modes described of treating, preparing, and combining the substances specified, and the product or products thereof—such product or products forming a new and useful species of fuel.

2. The sole use of the combinations described of certain substances with coke, producing by such combinations a material or substance applicable to many useful and ornamental purposes.

GEORGE STACEY, of Uxbridge, machinist. *For certain improvements in machinery for reaping, mowing, and delivering dry or green crops.* Patent dated January 24, 1852.

Mr. Stacey's reaping machine is another of the same class as Mr. M'Cormick's American Reaper, described at p. 481, vol. liv. Mr. Stacy's machine has a travelling web on to which the cut grain falls, and a cradle at the side of the machine into which it passes, and which periodically discharges it in sufficient quantity to form a sheaf. The cutting blades are of a spear shape, one half (every alternate one) fixed, the others moveable on pins at the centre of their length by means of a bar which connects all the back ends of the moveable blades (which project behind the cutter bar to the same extent as in front), and is worked by a crank from the principal bearing wheel. The reel, which forms a conspicuous feature of Mr. M'Cormick's machine, is in Mr. Stacey's dispensed with.

PETER ARMAND LECOMTE DE FONTAINEMOREAU, of South-street, Finsbury. *For certain improvements in lithographic, typographic, and other printing presses, which improvements are also applicable, with certain modifications, to extracting saccharine, oleaginous, and other matters, and to compressing in general.* (Being a communication.) Patent dated January 24, 1852.

Claims.—1. An arrangement of apparatus for obtaining impressions from lithographic stones (by means of a rubber).

2. A modification of the same for obtaining impressions from typographic plates.

3. An arrangement of apparatus for extracting saccharine, oily, and other similar matters. (The substances to be pressed are received between two endless chains of metal plates which travel between rollers, by which the compression on the plates and material between them is produced. The lower plate is perforated to allow of the escape of the expressed matters, and the spent materials are discharged by the traverse of the chains of plates.)

4. The application of the said arrangements to compressing in general.

RICHARD FORD STURGES, of Birmingham, manufacturer. *For an improved method or improved methods of ornamenting metallic surfaces.* Patent dated January 24, 1852.

Mr. Sturges' improvements consist in producing ornamental designs on metal surfaces by interposing a pattern or design formed of wire, paper, lace, or other fabric between two plates of metal, and then applying pressure so as to impress the design into or upon the metal. This method ornaments both plates at the same time, but a single plate may have a design transferred to it by laying the pattern surface thereon, and then applying pressure as before directed. Gold, silver, copper, iron, tin and lead, tinned iron, brass, German silver, and Britannia metal are suitable for being ornamented by the above method.

Claim.—The ornamenting of metallic surfaces by impressing patterns or designs made of metal, paper, or other material or fabric upon the said surfaces.

JOSEPH MAUDSLAY, of the firm of Maudslay, Sons, and Field, of Lambeth, engineers. *For improvements in steam engines, which are also applicable, wholly or in part, to pumps and other motive machines.* Patent dated January 26, 1852.

We shall give a full description of Mr. Maudslay's improvements, with engravings, in an early number.

JAMES JOSEPH BRUNET, of the Canal Iron-works, Poplar, engineer. *For certain improved combinations of materials in ship-building.* (Communication from Lucien Arman, of Bordeaux.) Patent dated January 27, 1852.

This invention has for its object the combination of wood and iron in ship-building, in such a manner that vessels constructed upon this plan shall possess all, or nearly all, the strength, lightness, and rigidity of vessels built wholly of iron, without that extreme liability to fouling and corrosion, and to injury from shot, which has hitherto formed the great objection to the adoption of iron as a material for ship-building.

A framing of timbers, but of considerably reduced scantling, and placed at a greater distance than usual from each other, is to be formed and secured as generally done to the keel. The distances apart of the timber frames may be increased as far as it can be done with a due regard to the thickness of the outside wood planking. An iron kelson, formed of plate and angle iron, is substituted for the ordinary wooden kelson. This iron kelson is securely fastened between the timber framing and filling-up pieces. Then beginning about midships, and proceeding towards the fore and after part of the vessel, a second framing of iron ribs, formed of double-angle iron, riveted together, or iron rolled somewhat in the shape of the letter Z, is introduced, extending from the under part of the deck to the iron kelson. These iron ribs are bolted and secured to each of the timbers of the wood framing, which they cross diagonally at an angle of about 45°, and the lower ends of these iron ribs are continued forward and aft, so as to connect with and to form a part of the iron kelson. The distance of these diagonal iron ribs from centre to centre will be according to the degree of strength required; and if the distance be considerable, it will be advisable to introduce filling-in pieces of wood of the same depth as the iron ribs, properly secured to the timber framing. These filling-in pieces will give additional support to the longitudinal plate-iron strakes or lining hereafter mentioned. Iron shelf pieces, clamps, &c., are fixed to the above-mentioned iron framing, as generally introduced in iron vessels. The beams may be of timber or iron. Engine-bearers for steam vessels may be formed, as usual, of plate and angle-iron, and fastened on the timber framing previously to the outside planking being bolted on. Iron bulkheads may also be bolted to the wooden framing by angle-iron in the usual manner. For additional strength and rigidity, plate-iron riders may be introduced, extending from the under part of the beams to the iron kelson.

When the diagonal iron frame is perfectly made fast, and riveted securely together with the iron kelson, shelf-pieces, clamps, &c., the outside planking, main wales, &c., may be proceeded with as commonly done, and bolted to the timber framing. It is advisable then that the whole, both wood and iron, should be well painted. Afterwards longitudinal iron strakes are riveted or bolted to the inner surface of the iron ribs. These strakes may be so arranged as to divide equally, or nearly so, the distance between the clamps and the floor or lower futtock heads of the timber framing, or they may cover the whole of this space, if thought advisable or advantageous, or for the engine-room, as a preventive against fire. But if open spaces or interstices are left between the plate-iron strakes, the iron framework or ribs, as well as the timber framing and inside part of the outside planking, will be fully exposed to view, so that those parts may be inspected, repaired, and painted from time to time (the cargo being removed) with more facility than in other

vessels, and consequently, a ship built according to this plan, will last a much longer time than usual. This is decidedly one of the greatest advantages of this system of ship-building, since a leak may be discovered and remedied without injuring or destroying any part of the hull. To prevent any portions of the cargo from finding their way into these interspaces, they may be covered over with moveable or sliding panels, composed either of wood or iron. The union of these two framings, iron and wood, allows of the introduction of the different systems of fastenings applicable to each material; and it may justly be said that this plan of building combines all the solidity and stiffness of iron vessels, with all the advantages of a timber-built ship coppered and copper-fastened. The solidity added by the iron framing to the timber frame permits the latter to be so considerably reduced in bulk that, by this combination of timbers, angle, and plate-iron, hulls of vessels built according to this plan will be both stronger and lighter than those built according to the old system.

Claim.—The combination, in ship-building, of wood and iron frames, in the manner before described.

William Dray, of Swan-lane, Upper Thames-street, agricultural implement maker. *For improvements in reaping machines.* (A communication from Obed Hussey, of Baltimore.) Patent dated January 27, 1852.

In its general structure, the reaping machine, which forms the subject of this patent, bears considerable resemblance to that of Mr. M'Cormick. The cutting of the grain is affected by an oscillating serrated blade, or series of blades, worked by a crank from the main bearing wheel. The machine may have a stationary platform, from which the cut grain would be delivered by a rake. Or it may have a tilting platform for the same purpose. It may also be provided with a revolving reel for laying the corn towards the cutting blades.

Mr. Dray claims the combined methods of apparatus and machinery substantially as described.

Joseph Vincent Melchior Raymondi, of Paris, machinist. *For certain improved statistics and descriptive maps.* Patent dated January 27, 1852.

This invention consists of a system or method of arranging advertisements of all kinds in a tabular form, whereby the unnecessary repetition of words of the same import in several advertisements of a similar character is obviated.

Claim.—The construction of abbreviating tables for publishing advertisements at a smaller cost, and with greater effect than by the mode hitherto employed.

Jean Benjamin Coquatrix, of Lyons, merchant. *For an improved apparatus for lubricating machinery.* Patent dated January 27, 1852.

Claim.—The manufacture of lubricating apparatus wherein the valve, past which the lubricating material flows, is adjusted by means of an axial motion, and at the same time the position of the valve, with respect to its seat, is indicated by means of a click or spring.

William Brindley, of Queenhithe. *For improvements in the manufacture of flocked fabrics and in the manufacture of buttons.* Patent dated January 27, 1852.

1. Mr. Brindley's improvements consist in waterproofing paper and woven fabrics previous to applying flock to the same. The flock is applied on such waterproofed materials in the usual way, excepting that the use of size as a preparatory step in the process may be dispensed with. Paper prepared in this way may be used for covering buttons, in the manner adopted in making die and pressure-made buttons. It is also useful for book-covers, and when the flock is applied on both sides, as wadding for guns.

2. Mr. Brindley proposes to cover buttons made by the die and pressure process with paper japanned in the manner adopted when japanning leather.

Claims.—1. The application of flock to paper and other fabrics prepared as aforesaid.

2. The manufacture of buttons from paper prepared as explained.

Edward Simons, of Birmingham, tallow-chandler. *For certain improvements in lighting.* Patent dated January 27, 1852.

Claims. — 1. Several methods of compressing and locking the springs of candle-lamps.

2. Certain additions to and improvements in candle-lamps, to fit them for kitchen and nursery use.

3. The addition of curved or straight spear points to candle-lamps and other lamps, for the purpose of facilitating the fixing of such lamps in mines and other places; and also the guarding of such candle-lamps with wire-gauze.

4. A method of constructing safety-lamps for mining purposes.

5. A method of constructing lamps and candlesticks with moveable reflectors for mining purposes.

Julian Bernard, of Guildford-street, Russell-square, gentleman. *For improve-*

ments in the manufacture or production of boots and shoes, and in materials machinery, and apparatus connected therewith Patent dated January 27, 1852.

Mr. Bernard's improvements comprehend:

1. Certain mechanical arrangements for cutting, shaping, and pressing the soles of boots and shoes.

2. Certain novel arrangements of apparatus for effecting the paring of the edges of the uppers.

3. An improved system or mode of lasting or mounting the uppers on the last.

4. An apparatus for inserting plastic materials into the soles of boots and shoes, for securing them to the uppers.

5. An arrangement for inserting pegs into suitable holes in the soles and heels for the same purpose.

6. An arrangement of apparatus for forming pegs for boot and shoe soles of leather which has been previously cut and pressed by machinery adapted for that purpose.

7. An improved system of securing the different parts of boots and shoes together by forcing plastic materials into suitable holes formed for that purpose.

8. A novel method of preparing materials to be used in the manufacture of boots and shoes, for the purpose of rendering the same waterproof.

George Duncan, of the New North-road, Hoxton; and Arthur Hutton, of Herbert-street, New North-road, Hoxton. *For improvements in the manufacture of casks.* Patent dated January 27, 1852.

The patentees describe several arrangements of machinery

1. For giving form to the jointing edges of wood-planks for the staves of casks.

2. For producing edges to the parts for forming the heads of casks.

3. For drilling the holes for the dowels used in putting together the heads of casks.

4. For giving form to the outer edge or circumference of wood blanks for heads of casks.

5. For putting together the parts of casks, and also for effecting, by means of suitable cutters, the hollowing, the bevelling of the ends of the staves, and the formation of the grooves to receive the heads.

Claim.—The modes described of arranging and combining mechanical parts into machines for the manufacture of casks.

Thomas Lambert, of Hampstead-road, pianoforte-manufacturer. *For certain improvements in pianofortes.* Patent dated January 27, 1852.

Claims.—1. The buffing of the jack or hopper-head, in place of the under lever.

2. The application on adjusting or regulating screw-head, buffed as aforesaid, in combination with a plain bevelled under-lever.

3. The sliding action of the said buffed jack-head upon the smooth uncovered bevelled end of the under-lever.

Isham Baggs, of Liverpool-street, electrical engineer. *For improvements in crushing gold quartz and metallic ores.* Patent dated January 29, 1852.

A description of Mr. Baggs's improved machinery has already appeared in our pages (see *ante* p. 89); we now, therefore, give only the claims made in the enrolled specification.

Claims.—1. The direct application of steam or atmospheric pressure to the movement of stamps for crushing and pulverizing gold quartz and metallic ores in any stage of preparation,—and this whether such stamps are lifted by the force of steam or atmospheric pressure, or are caused to descend alone by such force, or are lifted and caused to descend thereby.

2. The use of a second and independent cylinder for working the valves of engines for all such stamping machines employed in the process of crushing gold quartz and metallic ores.

3. The use of a moveable table placed under the stamp, for the purpose of feeding such engines in a regular manner with gold quartz and metallic ores to be crushed, and of clearing the same away after pulverization.

4. A mode of forming the stamps of such engines of a single piece.

Isaac Lewis Pulvermacher, of Vienna, engineer. *For improvements in galvano-electric, magneto-electric, and electro-magnetic apparatus, and in the application thereof to lighting, telegraphic, and motive purposes.* Patent dated January 29, 1852.

Claims.—1. Certain capillary batteries composed of several electromotor surfaces placed at small distances from each other, and excited by the oxygen of the atmosphere, or other electro-positive or electro-negative gases, together with electro-positive or electro-negative fluids.

2. Certain hygroscopical batteries, which maintain and keep up a constant and uniform electrical excitement, from their capacity for absorbing oxygen and atmospheric moisture.

3. Several arrangements of portable capillary chain batteries.

4. A quantity changer, which allows of the quantity of electricity of any number of elements being changed into intensity, and *vice versâ*, by a single movement.

5. A clockwork apparatus for breaking and making the currents.

6. An apparatus for breaking and making electrical currents.

7. The application of the batteries described to lighting, telegraphic, and motive purposes.

8. An instrument for varying the intensity of the electrical current according to the nature of the battery producing it.

François Jules Manceaux, of Paris, gun-manufacturer. *For improvements in fire-arms, and in instruments and apparatus used in connection therewith.* Patent dated January 29, 1852.

For specification of this invention see the first article of our present Number.

Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. *For improvements in the manufacture of pigments or paints.* (A communication.) Patent dated January 29, 1852.

This invention consists in partially decomposing serpentine and other similar rocks containing magnesia and oxide of iron in combination with silicic acid by the use of certain acids, so as to obtain thereby a basis which may be united with various colouring matters for the production of a new class of pigments or paints.

The following methods of preparing different colours will serve to illustrate the invention.

Blue.—The serpentine or other mineral used is to be finely powdered and placed in a suitable receptacle; then, to every 100 lbs. by weight thereof, are added 10 lbs. of prussiate of potash dissolved in 40 lbs. of hot water. When these have been well mixed by stirring, there are added 25 lbs. of sulphuric acid diluted with 25 lbs. of water, and the mixture is again well stirred. After a short time the mass becomes converted to a fine blue pulp. About 50 lbs. of water are then added to dissolve out the soluble salts, and the mixture is allowed to remain quiescent for about 36 hours. The supernatant water is then drawn off, and the pulpy residue washed, withdrawn, and dried, after which it may be used as a pigment when ground with oil, or in any other way. The water drawn off contains sulphate of magnesia, which may be obtained by evaporation.

Chrome Green.—The quantity of blue obtained by the preceding process has mixed with it, by stirring, 15 lbs. of acetate of lead, or an equivalent quantity of another salt of lead dissolved in 20 lbs. of water. A further addition is then made of 15 lbs. of bichromate of potash dissolved in 20 lbs. of water, after which the mass is washed and dried, and thus brought to a fit state for use.

Yellow.—To every 100 lbs. of ground rock the patentee adds 50 lbs. of acetate of lead, or an equivalent of another salt of lead, and 10 lbs. of muriatic or hydrochloric acid diluted with 40 lbs. of water. Then, after mixing the mass by repeated stirrings, he adds 50 lbs. of bichromate of potash dissolved in 50 lbs. of water, and again stirs the mass. The precipitate resulting from this process is washed and dried as above directed.

Black.—To every 100 lbs. of rock, ground to a fine powder, the patentee adds 50 lbs. of sulphuric or other acid diluted with 50 lbs. of water. After well stirring the mass, he adds 10 lbs. of logwood, or nutgalls, or an equivalent of other substance containing tannin, boiled in 40 lbs. of water and strained, and mixes the whole carefully. The product is then washed and treated as above directed in the case of the blue colour.

Claims.—1. The method of preparing the basis above mentioned by treating the natural silicates of magnesia and iron, or substances wholly or in part composed of those matters, with an acid, so as to produce partial decomposition of the same.

2. The production of a class of pigments or paints by uniting various colouring matters with a basis formed by the decomposition of the mineral serpentine, or other allied rocks which contain magnesia and iron combined with silicic acid, or of mineral substances consisting in part of the silicates of magnesia and iron.

Specifications Due, but not Enrolled.

Nelson Smith, of New York, United States, gentleman. *For improvements in the construction of violins and other similar stringed musical instruments.* (Being a communication.) Patent dated January 27, 1852.

Alexander Mills Dix, of Salford, brewer. *For certain improvements in the method of ventilating apartments or buildings, and in the apparatus connected therewith.* Patent dated January 27, 1852.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Henry Wickens, of Carlton-chambers, Regent-street, Westminster, gentleman, for improvements in obtaining motive power. (Being a communication.) July 31; six months.

Samuel Starkey, o Clapton, Middlesex, gentleman, for improvements in machinery for washing minerals, and separating them from other substances. July 31; six months.

John Gerald Potter, of Over Darwen, Lancaster, carpet-manufacturer, and Matthew Smith, of the same place, manager, for certain improvements in the manufacture of carpets, rugs, and other similar fabrics. July 31; six months.

William Edward Newton, of Chancery-lane, Middlesex, civil engineer, for improvements in the construction of wheels for carriages. (Being a communication.) July 31; six months.

William Ackroyd, of Birkenshaw, near Leeds, for improvements in the manufacture of yarn and

fabrics when cotton, wool, and silk are employed. July 31; six months.

William Hetherington, of Hansworth, near Birmingham, gentleman, for improved machinery for stamping or shaping metals. (Being a communication. August 3; six months.

LIST OF IRISH PATENTS FROM THE 18TH OF MAY TO THE 16TH OF JULY, 1852.

William Hindman, of Manchester, Lancaster, gentleman, and John Warhurst, of Newton Heath, near Manchester, cotton dealer, for certain improvements in the method of generating or producing steam, and in the machinery or apparatus connected therewith. June 3.

Richard Archibald Brooman, of the firm of J. C. Robertson and Company, of 166, Fleet-street, London, patent agents, for improvements in presses, and pressing, in centrifugal machinery, and in apparatus connected therewith, part or parts of which are applicable to various useful purposes. (Communication.) June 3.

Richard Archibald Brooman, of the firm of J. C. Robertson and Company, of 166, Fleet-street, London, patent agents, for certain improvements in the preparation and treatment of fibrous and membraneous materials, both in the raw and manufactured state, in applying electro-chemical action to manufacturing purposes, and in the manufacture of saline and metallic compounds. (Communication.) June 4.

William Cardwell M'Bride, of Allstragh, Armagh, farmer, for certain improvements in machinery for scutching, or otherwise preparing flax and other like fibrous materials. June 4.

William Watt, of Glasgow, Lanark, N. B., manufacturing chemist, for improvements in the treatment and preparation of flax or other fibrous substances, and the application of some of the products to certain purposes. June 15.

Richard Christopher Mansell, of Ashford, Kent, for improvements in the construction of railways, railway rolling stock, and in the machinery for the manufacturing the same. June 21.

John Harcourt Brown, of Aberdeen, and John Mackintosh of the same place, for improvements in the manufacture of paper, and articles of paper. June 21.

Thomas Twells, of Nottingham, manufacturer, for certain improvements in the manufacture of looped fabrics. June 30.

Peter Bruff, of Ipswich, Suffolk, civil engineer, for improvements in the construction in the permanent way of rail, tram, or other roads, and in the rolling stock or other apparatus used thereof. July 16.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
July 30	3343	John Crosby	Fakenham	Safety sea-bathing Machine.
,,	3344	Richards and Company	Bishopsgate-street	Gold-washing machine.
,,	3345	H. E. Thompson	Oxford-street	Portable metallic bedstead.
Aug. 2	3346	G. B. Davies	Halifax	Coat.
3	3347	W. Dray and Company	London-bridge	Box gearing.

CONTENTS OF THIS NUMBER.

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ROBERTS'S PATENT DIGGING-MACHINE.

Fig. 1.

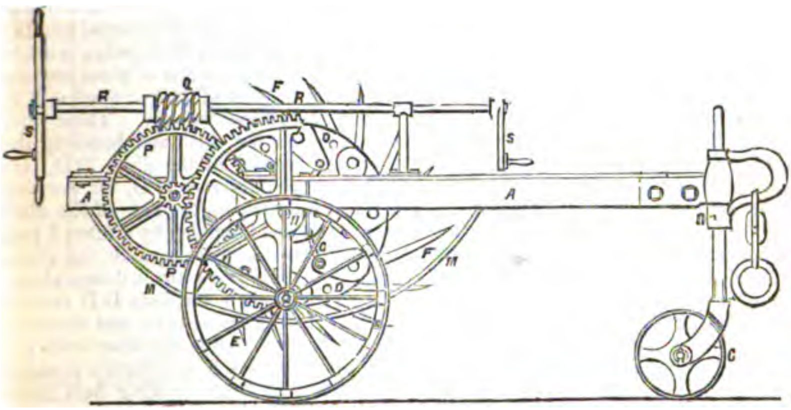
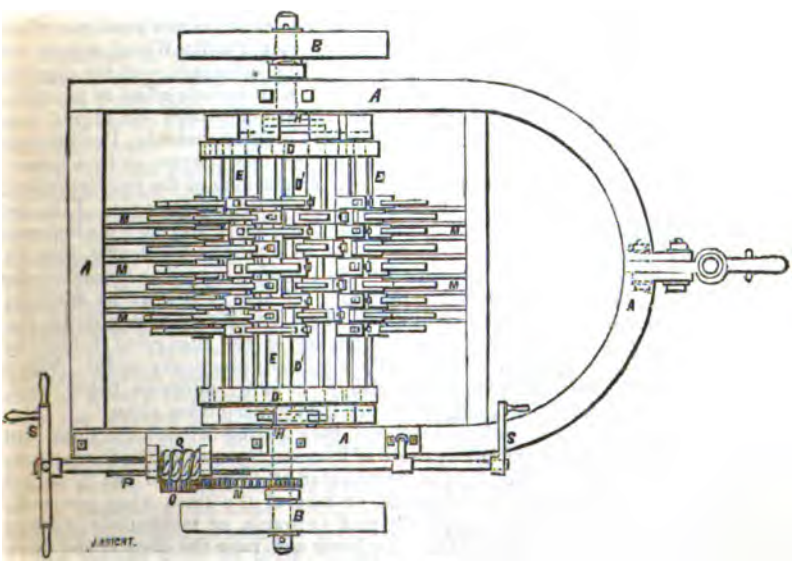


Fig. 2.



ROBERTS'S PATENT DIGGING-MACHINE.

(Patent dated January 31, 1822. Patentee, Martyn John Roberts, Esq., of Woodbank, Gerrard's Cross, Bucks. Specification enrolled January 31, 1852.)

Specification.

My invention consists of a machine for digging, tilling, or breaking up of land, the general construction and arrangement of which is represented in figures 1, 2, 3, 4 and 5, of the engravings hereunto annexed; fig. 1 being a side elevation; fig. 2, a plan; and fig. 3, a side view of the digger detached from the framing. A A is the framework supported upon wheels B B, and C. D D are two parallel discs of cast iron connected together by the tube D^1; they have in their outer circumference a series of holes, about sixteen in number, to receive the ends of an equal number of shafts, or rocking bars, E E, which are free to revolve within them, when worked in the manner hereinafter to be explained. On to the square parts of these rocking bars are fixed, in the manner shown in figs. 4 and 5, a series of tines or spades, F F, about 4 or 5 inches apart from each other, and about 12 inches long. These tines are for the purpose of entering into and throwing up the earth and breaking the clods. At the end of the rocking-bars E E, and outside of the discs D D, are fastened short levers F F, to which are attached connecting-rods G G, for working the levers and their rocking-bars by means of an eccentric on the axle of the discs D D, or by a cranked axle H. When the discs are fastened together by a tube, I pass through it an iron axle, which is cranked to about 2 or 3 inches outside the discs, and is firmly fixed to the framing A, by which the whole apparatus is drawn along, either by horse or steam power. Now it will be seen, that if the discs D D revolve freely on this axle, while the cranked axle is fixed to the framework, and the connecting-rods G G are fixed to the levers F F, at one end, while the other ends are fixed to the cranked axle, the levers, and their attached bars E, will have a rocking motion backwards and forwards, because the centre of these rocking bars turns eccentrically to the centre of the pin of the cranked axle. The position of the crank pin to the vertical line, as regards the discs, will in some measure depend on the relative diameter of the discs, and the length of the tines, the object being to obtain by the compound motion of the onward movement of the discs, their revolution round their axes, and the rocking of the bars E, such a motion in the tines as shall cause them to enter the earth with the least possible effort, and to leave it in the best position to carry up earth with them. The action of this machine, when at work, is similar to the action of Morgan's Feathering Paddle-Wheel, where the floats may be supposed to resemble the tines, with this difference,—in my digging machine, though I cause the tines to enter the earth with as little effort as possible, as does the paddle-wheel into the water; yet, in the paddle-wheel, the object is to have as little back water as may be, whereas, in my digging-machine, I endeavour to obtain as much earth thrown up as possible; and this I arrive at by a proper adjustment of the crank pin, or eccentric, which in the machine of the size described, and represented in the engravings, is vertical over the centre of the axle. I do not confine myself to cranking the axle outside the discs, as it may be done between them; but in that case, I would not join the discs by a tube in the centre, but by cross bars in the periphery, or nearly so. Nor do I confine myself to obtaining the proper motion of the tines by cranking the axle, for the same may be done by means of an eccentric on the axle, or by cams, these being only variations in the mechanical arrangements for obtaining the motion of the tines; but I find by experience, the method first before described, to be most practically useful. When this digging-machine is used upon stony, clayey, or other adhesive heavy land, the tines become clogged unless some means are used to keep them clean.

This may be effected by a comb or a series of bars passing between the tines, but I prefer using fixed segments of circles made of iron and fastened to the framework, eccentrically to the centre of the discs as represented at M M, figs. 1 and 2, so that they touch, or nearly touch the rocking-bars or base of the tines, when perpendicularly below the axle, and then gradually pass outwards, or tangentially, as they approach a point horizontal to the axle. To lower and raise the discs D and tines into and out of the ground, I make use of the following arrangements: N is a

Fig. 4.

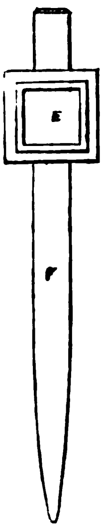
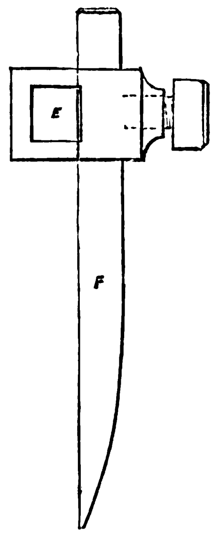


Fig. 3.

Fig. 5.



toothed segment fixed on to one end of the cranked axle, and geared into by a pinion O, cast in a piece with a worm-wheel P, set in motion by the endless-screw Q, on the rod R, supported on the framework and turned by the handles S S, which, according to the direction in which they are moved, lower or raise the framework A, and discs D.

WOOL FROM WOOD.

(Translated from the *Moniteur Industriel* for the *Mechanics' Magazine.*)

According to the "*Bibliothèque de Genève,*" this is what the Germans do with the forest pine. Many of our readers may hardly have believed it was so valuable a tree.

Not far from Breslau, in Silesia, in a demesne called Humboldt's Meadow, there are two establishments, in one of which the leaves of the pine-tree are converted into a species of wool or cotton, and in the other the waters left from the manufacture of this substance serve to supply medicated baths for the use of sick persons. These establishments were both set on foot under the superintendence of a forest inspector, M. de Pannewitz, the inventor of a chemical process for extracting from long and slender pine leaves a very fine fibrous substance, which he calls "wood-wool," on account of its possessing the same felting and spinning properties as ordinary wool.

The circular leaves of pines, firs, and other coniferous trees, are composed of clusters of extremely delicate, adhesive fibres, surrounding and holding together a resinous substance: this resinous substance may be dissolved by boiling, and by the employment of certain reagents; it then becomes easy to separate the fibres from each other, to clean them, and remove any extraneous matter. By this treatment the woolly material acquires a greater or less degree of fineness. The pine may even be stripped when quite young; for if the verticles or whorls at the end of the branches are left, the tree will continue to grow. The stripping off of the leaves takes place every two years.

The use to which this wood-wool was first applied, was to substitute it for cotton or woollen wadding in quilted blankets. In the year 1842, the Hospital at Vienna purchased five hundred of these blankets, and after making a trial of

them for several years, sent an order for a further supply. It has been observed that when this pine-tree wool is employed, the beds are quite free from any sort of parasitical insects, and it diffuses a very agreeable and salutary fragrance. Furniture in which this material is employed is free from moths. Its cost is three times less than horse-hair, and the most skilful upholsterer could not distinguish an article stuffed with this substance from one stuffed with horse-hair. This wool may be spun and woven, the finest quality yielding a thread very similar to flax, and quite as strong. When combed, spun, and woven (?) like cloth, it may be employed for carpets, saddle-cloths, &c., and combined with a weft of linen or calico, it may be made up into coverlets.

The liquid residuum resulting from the boiling of the leaves has a most salutary influence when used as a bath. The reputation of the baths has increased since their establishment, nine years ago. The liquid residuum may, moreover, be concentrated, and sent in closed jars for use in private houses.

The membraneous substance obtained by filtration, when the fibre is washed, is put up in the shape of bricks, and dried, when it may be used as fuel, and produces a very considerable quantity of gas for lighting purposes. About a thousand cwt. of wool leaves a quantity of fuel equal in value to more than 180 cube feet of pine wood.

THE EXCISEMAN'S STAFF QUESTION.

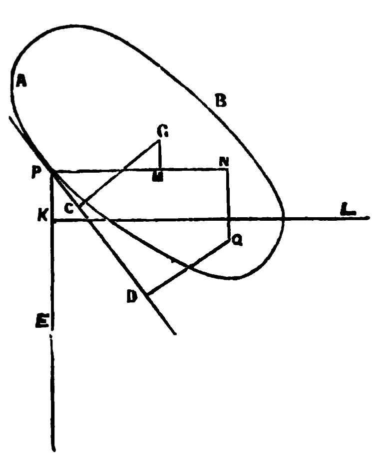
Sir,—The celebrated question of the "*Exciseman's Staff*" has been the subject of considerable discussion in the latter Numbers of your highly interesting and useful Magazine. Several of my friends, as well as myself, all constant readers of your valuable Journal, have been interested in the discussion of this question; and although we rejoice that our friend Mr. Wilkinson has introduced to your pages a subject so highly interesting to the cultivators of pure and mixed science as the "Exciseman's Staff Question" undoubtedly is, still we cannot but regret the circumstance that some of your correspondents have manifested, in their communications on this question, a spirit which is by no means suitable to the free discussion of philosophical truths.

It is in consequence of the interest which has been excited in several of my friends by the various communications which have appeared in your Journal, that I offer the following observations for your consideration. I shall feel happy if you think them worthy of a place in your very excellent Magazine.

I am, Sir, yours, &c.,

WORKMAN.

If I understand the question of the *Exciseman's Staff* properly, it is a particular case of a more general question, which may be stated as follows:



A material body APB rests on a point P by means of the friction at P, and a force F acting upwards at a given point Q parallel to gravity. Required the equations of equilibrium.

Let G be the centre of gravity of the body, and draw GC, QD perpendicular to PD, a line touching the body at P.

Put W = the weight of the body acting at G.

F = force acting vertically upwards at Q.

R = pressure at P in a vertical direction EP.

μ = coefficient of friction.

$\beta = \angle$ DPE.

Because the forces R and F act parallel to the force of gravity, and in the same direction, therefore we shall have

$$R = W - F \ldots\ldots\ldots (1).$$

In order to obtain the normal pressure at the point P, the force R must be resolved in a direction perpendicular to the tangent PD.

Therefore, the normal pressure at $P = R \sin. \beta$.

Now, the friction at the point P is equal to the rectangle of the normal pressure and the coefficient of friction.

Then, the friction at

$$P = \mu R \sin. \beta.$$

$$= \mu (W - F) \sin. \beta .. (2).$$

It will be readily seen that

$W \cos. \beta$ = resolved force of gravity in the direction PD.

$F \cos. \beta$ = resolved force of F in the direction DP.

$$\therefore \mu(W - F) \sin. \beta + F \cos. \beta = W \cos. \beta \ (3).$$

This equation is necessary to prevent motion in the direction of the tangent PD when the body is upon the point of sliding downwards. That the body cannot be upon the point of sliding upwards, without F be greater than W, is too obvious to need much explanation. If F be equal to W, there will be no normal pressure at the point P; if F be greater than W, the body will be removed from the point P, and there will be no equilibrium, unless the body be connected with the point P by means of a hinge—a condition which is not implied in the question.

Therefore, the force F can never be greater than W, and consequently the body can never be upon the point of sliding upwards.

The remarks made by your correspondent Mr. T. Smith, in pages 404—405 of No. 1502 respecting the *superior* and *inferior* states bordering upon motion, though very proper and useful in many mechanical considerations, do not appear to be available in this particular question.

From equation (3) we obtain

$$\cot. \beta = \mu \ldots\ldots (4).$$

Therefore the inclination of the body to the horizon is independent of its weight and the force F acting upon it.

Draw PN perpendicular, and GM, QN parallel to PE.

In order that the body may not turn about the point P, it is necessary to have the equation of moments,

$$PM.W = PN.F.. \ .(5).$$

Put, $PC = s$; $GC = r$; $PD = X$; and $QD = Z$.

It is readily seen that

$$PM = r \cos. \beta + s \sin. \beta$$

$$PN = Z \cos. \beta + X \sin. \beta.$$

Substitute these values in equation (5), and it will become

$$W = F.\frac{X + Z \cot. \beta}{s + r \cot. \beta} \ldots (6).$$

This equation, together with equation (4), determine the position of the body in a state of equilibrium.

The equilibrium will not be disturbed by supposing that part of the body below the line KL, perpendicular to EP, to be immersed in a fluid, and the point Q to be the centre of buoyancy. In this case the fore F, acting at Q, will be equal to the weight of the fluid displaced by the body, and the point Q will be the centre of gravity of the part immersed.

Put V = volume of fluid displaced.

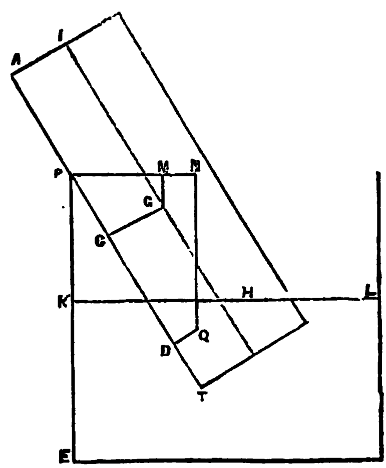
D = weight of an unit of the fluid.

Then, $F = DV \ldots\ldots (7)$.

Substitute this value in equation (6), and it will become

$$W = DV.\frac{X + Z \cot. \beta}{s + r \cot. r} \ldots (8).$$

If we suppose the body to be a cylinder, as is the case with the *Exciseman's Staff Question*, the values of X and Z can be readily obtained.



Put l = length of cylinder.

r = GC the radius of the cylinder.

IH = m the part of the axis of the cylinder which is out of the fluid.

KP = k the distance from P to the water-line.

It is not difficult to prove the following relations.—(See *Lady's and Gentleman's Diary* for the year 1851, p. 61.)

$$PD = X = n + \frac{m}{2} - \frac{r^2 \tan.^2 \beta}{8(l-m)} \ldots. (9).$$

$$DQ = Z = \frac{r^2 \tan. \beta}{4(l-m)} \ldots. (10).$$

$$DV = Dr^2\pi(l-m) \ldots. (11).$$

Where DV is the weight of the displaced fluid. And,

$$n + m = r \tan. \beta + k \sec. \beta + \frac{l}{2} \ldots\ldots (12).$$

Substitute these values in equation (8), and it becomes

$$W = Dr^2\pi. \frac{8(r \tan. \beta + k \sec. \beta)(l-m) + 4(l-m)^2 + 2r^2 - r^2 \tan.^2 \beta}{8r(\tan. \beta + \cot. \beta) + 8k \sec. \beta - 4l + 8(l-m)} \ldots. (13).$$

$$\text{Or, } W = Dr^2\pi. \frac{8(l-m)\left(n + \frac{m}{2}\right) + 2r^2 - r^2 \tan.^2 \beta}{8(n + r \cot. \beta)} \ldots. (14).$$

If we take the particular case $n = \frac{l}{2}$ $\therefore m = r \tan. \beta + k \sec. \beta$, from Equation (12).

This equation agrees with equation (7) in Mr. Tebay's solution, p. 346.

With this supposition, equation (14) becomes

$$W = Dr^2\pi. \frac{4(l^2 - m^2) + 2r^2 - r^2 \tan. \beta}{4l + 8r \cot. \beta} \ldots. (15).$$

This is the particular case investigated by the distinguished mathematician, Mr. Tebay, p. 345, No. 1499.

By taking the numerical data furnished by Mr. Tebay, equation (15), will give the weight of the staff equal to 8·1789 oz. Mr. Tebay makes the weight 8·2573 oz.

Equation (15) ought to coincide with equation (3) of Mr. Tebay's solution, p. 346; the numerical results from each equation are nearly the same, but I have not been able to see their exact coincidence.

The value of PN = $b \cos. \theta + r \sin. \theta$, in p. 404, No. 1502, is slightly wrong, from the circumstance of supposing the centre of buoyancy B to be situated in the axis passing through G.

Equation (1), in the same page, is quite correct, it is proper to neglect friction in the formation of this equation, although friction does act at the point P. The equation (3), in the same page, is not correct, except F be equal to nothing, a condition not given by the question.

For a cylindrical staff of a given weight, the equation (13) will determine, by means of a quadratic, the length (m) of the axis out of the water. The question, then, will be possible or impossible, as the two roots of the quadratic are possible or impossible.

EMERY.

There are many who use emery every day, but who do not know where it comes from, or how it is manufactured for use. We have recent accounts of emery discoveries in Minesota, but nearly all that is used at present in the arts comes from Turkey, near ancient Smyrna. Dr. Lawrence Smith, the American geologist, made a discovery of a deposit of emery while residing in Smyrna, and he made an examination of the locality in 1847.

Dr. Smith having reported his discoveries to the Turkish government, a commission of inquiry was instituted, and the business soon assumed a mercantile form. The monopoly of the emery of Turkey was sold to a mercantile house in Smyrna, and since then the price has diminished in the market.

The mining of the emery is of the simplest character. The natural decomposition of the rock in which it occurs facilitates its extraction. The rock decomposes into an earth, in which the emery is found imbedded. The quantity procured under these

circumstances is so great that it is rarely necessary to explore the rock. The earth in the neighbourhood of the block is almost always of a red colour, and serves as an indication to those who are in search of the mineral. Sometimes, before beginning to excavate, the spots are sounded by an iron rod with a steel point, and when any resistance is met with, the rod is rubbed in contact with the resisting body, and the effect produced on the point enables a practised eye to decide whether it has been done by emery or not. The blocks which are of a convenient size are transported in their natural state, but are frequently broken by large hammers; when they resist the action of the hammer, they are subjected to the action of fire for several hours, and on cooling they most commonly yield to blows. It sometimes happens that large masses are abandoned, from the impossibility of breaking them into pieces of a convenient size, as the transportation, either on camels or horses, requires that pieces shall not exceed 100 lbs. each in weight.

Emery appears to be a mechanical mixture of corundum and oxide of iron.

When reduced to a powder, it varies in colour from dark grey to black. The colour of its powder affords no indication of its commercial value. The powder examined under the microscope shows the distinct existence of two minerals, corundum and oxide of iron. Emery, when moistened, always affords a very strong argillaceous odour. Its hardness is its most important property in its application to the arts, and was ascertained by Mr. Smith in the following manner:—Fragments were broken from the piece to be examined, and crushed in a diamond mortar with two or three blows of a hammer, then thrown into a sieve with 400 holes to the inch. The powder is then weighed, and the hardness tested with a circular piece of glass, about four inches in diameter, and a small agate mortar. The glass is first weighed, and placed on a piece of glazed paper; the pulverized emery is then thrown upon it at intervals, rubbing it against the glass with the bottom of the agate mortar. The emery is brushed off the glass from time to time with a feather, and when all the emery has been made to pass once over the glass, it was collected, and passed through the same operation three or four times. The glass was then weighed, again subjected to the same operation, the emery by this time being reduced to an impalpable powder. This series of operations is continued until the loss sustained by the glass is exceedingly small. The total loss in the glass is then noted, and when all the specimens of emery are submitted to this operation under the same circumstances, an exact idea of their relative hardness is obtained. The advantages of using glass and agate are, that the latter is sufficiently hard to crush the emery, and in a certain space of time to reduce it to such an impalpable state, that it has no longer any sensible effect on the glass; and, on the other hand, the glass is soft enough to lose during this time sufficient of its substance to allow of accurate comparative results. By this method, the best emery was found capable of wearing away about half of its weight of common French window-glass. The blue sapphire of Ceylon, pulverized and experimented with in this manner, wears away more than four-fifths of its weight. This furnished the standard of comparison.

In the ordinary process, the lumps of emery ore are broken up in the same manner as stone is for repairing Macadamised roads, and into lumps of similar size. These lumps are then crushed under stampers, such as are used for pounding metallic ores, driven by water or by steam power. It is supposed that the stampers leave the fragments more angular than they would be if they were ground under runners, a mode which is sometimes employed. The coarse powder is then sifted through sieves of wire cloth, which are generally cylindrical, like the bolting cylinders of corn-mills; but the sieves are covered with wire cloth, having in general about ninety to sixteen wires to the inch. No. 16 sieve gives emery of about the size of mustard-seed; and coarser fragments, extending nearly to the size of pepper-corns, are also occasionally prepared for the use of engineers. The sieves have sometimes as many as 120 wires in the inch; but the very fine sizes of emery are more commonly sifted through lawn sieves. The finest emery that is obtained from the manufacturers is that which floats in the atmosphere of the stamping-room, and is deposited on the beams and shelves, from which it is occasionally collected. The manufacturers rarely or never wash the emery; this is mostly done by the glass-workers, and such others as require a greater degree of precision than can be obtained by sifting.

Washing emery by hand is far too tedious for those who require very large quantities of emery, such as the manufacturers of plate-glass and some others, who generally adopt the following method:—Twelve or more cylinders of sheet copper, of the common height of about two feet, and varying from about 3, 5, 8, to 30 or 40 inches in diameter, are placed exactly level, and communicating at their upper edges, each to the next, by small troughs or channels; the largest vessel has also a waste-pipe near the top. At the commencement of the process, the cylinders are all filled to the brim with clean

water; the pulverised emery is then churned up with abundance of water in another vessel, and allowed to run into the smallest or the 3-inch cylinder, through a tube opposite the gutter leading to the second cylinder. The water during its short passage across the 3-inch cylinder, deposits in that vessel such of the coarsest emery as will not bear suspension for that limited time; the particles next finer are deposited in the 5-inch cylinder, during the somewhat longer time the mixed steam takes in passing the brim of that vessel; and so on. Eventually the water forms a very languid eddy in the largest cylinder, and deposits therein the very fine particles that have remained in suspension until this period; and the water, lastly, escapes by the waste-pipe nearly or entirely free from emery. In this simple arrangement, time is also the measure of the particles respectively deposited in the manufacture to which the emery is applied. When the vessels are to a certain degree filled with emery, the process is stopped, the vessels are emptied, the emery is carefully dried and laid by, and the process is recommenced.

Emery paper is prepared by brushing the paper over with thin glue, and dusting the emery-powder over it from a sieve. There are about six degrees of coarseness. Sieves with thirty and ninety meshes per linear inch, are in general the coarsest and finest sizes employed. When used by artizans, the emery-paper is commonly wrapped around a file or a slip of wood, and applied just like a file, with or without oil, according to circumstances. The emery-paper cuts more smoothly with oil, but leaves the work dull.

Emery cloth only differs from emery-paper in the use of thin cotton cloth instead of paper, as the material upon which the emery is fixed by means of glue. The emery cloth when folded around a file, does not ply so readily to it as emery-paper, and is apt to unroll. Hence smiths, engineers, and others, prefer emery-paper and emery-sticks; but for household and other purposes, where the hand alone is used, the greater durability of the cloth is advantageous.

Emery-sticks are rods of board about 8 to 12 inches long, planed up square; or with one side rounded like a half-round file. Nails are driven into each end of the stick as temporary handles, they are then brushed over one at a time with thin glue, and dabbed at all parts in a heap of emery-powder, and knocked on one end to shake off the excess. Two coats of glue and emery are generally used. The emery sticks are much more economical than emery paper wrapped on a file, which is liable to be torn.

Emery-cake consists of emery mixed with a little beeswax, so as to constitute a solid lump, with which to dress the edges of buff and glaze wheels. The ingredients should be thoroughly incorporated by stirring the mixture whilst fluid, after which it is frequently poured into water, and thoroughly kneaded with the hands, and rolled into lumps before it has time to cool. The emery-cake is sometimes applied to the wheel whilst they are revolving; but the more usual course is, to stop the wheel, and rub in the emery cake by hand. It is afterwards smoothed down by the thumb.

Emery-paper, or patent razor-strop paper, an article in which fine emery and glass are mixed with paper pulp, and made into sheets as in making ordinary paper; the emery and glass are said to constitute together 60 per cent. of the weight of the paper, which resembles drawing-paper, except that it has a delicate fawn colour. The emery-paper is directed to be pasted or glued upon a piece of wood, and when rubbed with a little oil, to be used as a razor-strop.

In 1842, Mr. Henry Barclay, of England, took out a patent for a method of combining powdered emery into discs and laps of different kinds, suitable to grinding, cutting, and polishing glass, enamels, metals, and other hard substances. The process of manufacture is as follows: — Coarse emery-powder is mixed with about half its weight of pulverized Stourbridge loam and a little water or other liquid, to make a thick paste; this is pressed into a metallic mould by means of a screw-press, and after having been thoroughly dried, is baked or burned in a muffle or close receiver at a temperature considerably above a red heat and below the full white heat. In this case, the clay or alumina serves as a bond, and unites the particles very completely into a solid artificial emery-stone, which cuts very greedily, and yet seems hardly to suffer perceptible wear.

Superfine grinding emery is formed into wheels exactly in the same manner as the above, but the proportion of loam is then only one-fourth instead of one-half that of the emery. Those emery-stones, which are of medium fineness, cut less quickly, but more smoothly than the above.

Flour-emery, when manufactured into artificial stones, requires no uniting substance, but the moistened powder is forced into the metal mould and fired; some portions of the alumina being sufficient to unite the whole. These fine wheels render the works submitted to them exceedingly smooth, but they do not produce a high polish on account of the comparative coarseness of the flour-emery.—*Scientific American.*

EXPERIMENTS ON ANCHORS.—SECOND SERIES.

The second series of these important trials commenced at Sheerness on the 23rd ult., and were terminated on the 4th instant. The following has been given as an analysis of the results:—

Trials.	Owners' Names.	Weight. Cwt.	qrs.	lbs.	Distance Dragged. ft.	in.	Advantage in favour of. ft.	in.
1	Admiralty's	24	2	9	66	6	0	0
	v.							
	Lennox's	24	2	10	35	11	30	7
2	Trotman's	26	0	6	27	3	17	4
	v.							
	Aylen's	25	0	13	44	7	0	0
3	Mitchesons and Sons'	25	0	14	48	0	16	2
	v.							
	Rodgers' Exhibition prize	24	2	22	54	2	0	0
4	Isaacs's	25	0	17	36	8	0	0
	v.							
	Honiball's	24	0	7	9	5	27	3
5	Trotman's	25	0	6	25	4½	24	19
	v.							
	Lennox's	24	2	10	50	2½	0	0
6	Honiball's	24	0	7	33	11	16	3½
	v.							
	Mitcheson and Sons'	25	0	14	50	2½	0	0
7	Aylen's	25	0	13	17	2	7	11
	v.							
	Rodgers' Exhibition prize)	24	2	22	25	1	0	0
8	Trotman's	25	0	6	8	2	49	6
	v.							
	Honiball's	24	0	7	57	6	0	0
9	Trotman's	25	0	6	36	3½	13	4
	v.							
	Admiralty's	31	1	0	49	7½	0	0
10	Aylen's	25	0	13	50	10	0	0
	v.							
	Rodgers' Exhibition prize	24	2	22	23	8	27	2

The trials will be resumed next week, at a position in the Medway, known as Black Stakes. The *modus operandi* will differ materially from former methods used, assimilating more in effect to actual use on board ship. Two Dockyard lighters will be used on the occasion, moored at certain distances apart; the anchor will be let go on either side, where fourfold purchase blocks will be attached, and the leading falls brought over the derricks to the capstan on board; thus a double power will be brought into use, and the strength as well as the holding powers of the anchors be most severely tested.

THE LIGHTHOUSE TOWER, GIBB'S HILL, BERMUDA. DESIGNED BY ALEXANDER GORDON, ESQ., C.E.

(From Paper read before the Institution of Civil Engineers, by Peter Paterson, Esq., C. E.)

Since the discovery of these islands by Juan Bermuda, in 1522, the want of a good sea light has been severely felt, the approach being both difficult and dangerous, and although the expeditions under Sir George Somers, in 1609 and in 1613, suffered from shipwreck, and the islands have been in the possession of the British for 230 years, yet, until lately, nothing was done to remedy so serious a defect. To other nations the Bermudas would be of little or no value; but to Great Britain they are important as a naval depôt, and as affording a stronghold and efficient place of refit and rendezvous for the fleets cruising in those latitudes, and for the protection of our possessions on the

continent of North America and in the West Indies.

A few years since the home government decided upon erecting a lighthouse, and in the expectation that the tower might be built of stone found on the islands, a lantern, and one of Fresnel's dioptric apparatus of the first order, were prepared by the Trinity Corporation; but after some progress had been made in quarrying and dressing the stone for a lofty tower on which to place the light, it was ascertained to be of too friable a character for the purpose; therefore, in 1842, the home government directed Mr. Alexander Gordon, M. Inst. C.E., to design a cast-iron tower, of a similar construction to that which he had previously erected at Morant Point, Jamaica, in the year 1841, and which had proved so successful. The site chosen by the naval and colonial authorities was the top of Gibb's Hill, on the southern part of the Bermudas, in latitude 32° 14′ N., and longitude 64° 50′ W. of Greenwich. This site was determined on because Bermuda was always approached with the greatest safety from the southward.

The form of the lighthouse, the base of which is 245 feet above the level of the sea, is that of a strong conoidal figure, 105 feet 9 inches in height, terminated at the top by an inverted conoidal figure 4 feet high, instead of a capital. The external shell of the tower is constructed of 135 concentric cast-iron plates, including those for the doorway. These plates vary in thickness from 1 inch at the base to about ¾-inch at the top; they have cast-iron flanges on the inside, 4 inches broad (including the thickness of the plate), and are further strengthened, at intervals of 12 inches, by angular feathers ½-inch thick; holes are drilled in all the vertical and horizontal flanges 6 inches apart, and the plates are united to form the tower by square-headed screw-bolts ¾-inch in diameter, with nuts and washers.

In the centre of the tower there is a column of cast-iron, 18 inches in diameter in the inside, the thickness of the metal being ¾ inch, for supporting the optical arrangement of Mr. Fresnel, and in which the weight of the revolving apparatus descends. This column was cast in nine lengths, each terminating with circular flanges, to which the floor-plates are bolted. At a height of 2 feet above each floor there is a man-hole, or opening into this hollow column, 26 inches high and 15 inches wide, to which wooden doors are fitted; it is thus enabled to be used during the daytime for passing stores up and down, and it likewise contains the waste-water pipe.

About 20 feet of the lower part of the tower is filled in with concrete, leaving a well in the middle, about 8 feet in diameter, faced with brickwork. There are seven floors, exclusive of the lantern floor, or gallery, each 12 feet in height. The first and second floors are cased with brickwork, and serve as oil and store rooms; the five upper floors are lined with sheet-iron, No. 16 gage, disposed in panels, with oak pilasters, cornices, and skirtings. On the first-floor there is a cast-iron kerb, 10 inches wide and 1 inch thick, on which a cast-iron floor-plate ⅝-inch thick is fixed by bolts ⅝-inch in diameter. The inner edges of this, and of all the other floor-plates in the tower, are bolted between the flanges of the corresponding parts of the hollow column, by ¾-inch bolts, nuts, and washers. The second-floor consists of ten radiating cast-iron plates, ⅝-inch thick, extending from the brickwork to the hollow column: these plates have flanges on their under side, and are held together by ⅝-inch bolts, at intervals of 6 inches. The third, fourth, fifth, sixth, and seventh floors, are similarly constructed; but the outer edges rest on the upper flanges of the carcass, corresponding with the position of the floors, being bolted to it by the same bolts which connect together the flanges of the carcass. The eighth floor, and also the floorway, consist of sixteen radiating cast-iron plates, ¾-inch thick, connected together in the same manner as the above, but with ½-inch bolts. All these plates are so arranged as to leave the necessary headway for the staircase on each floor. There are five windows on each floor, one in the centre of every alternate plate in the circle: these windows are 18 inches square, and are fitted with strong wooden ports, opening outwards, in which a plate of polished plate-glass, 9¼ inches square, is fixed, for giving light when the port is shut. There is also a window of the same dimensions in the circular well, for admitting light to the staircase; making 36 windows in all.

The staircase consists of two wrought-iron stringings, 1⅝-inch square, the risers and supports being ⅝-inch thick, with oak treads 1½-inch thick. To each step there is an iron balluster, ⅞-inch in diameter, on the top of which is fitted a wrought-iron hand-rail, 1⅜-inch wide and ⅝-inch thick. From the level of the bottom of the doorway, to the landing on the first-floor, the staircase rises spirally round the hollow column, the ballusters and rail being on the outer edge of the steps, whilst from the first-floor to the eighth-floor the staircase runs spirally round the respective rooms, the ballusters and rail being on the inner edge of the steps. There are standards and rails round the headways of all the floors; the standards are of wrought iron, 3 feet 6 inches in height, and 2 inches

in diameter at the bottom, tapering to 1¼ inch at the top; there are five of these standards on the first-floor, and three on each of the other floors.

A wrought-iron ring, in four pieces, 5 inches wide, and ⅝-inch thick, is attached to the underside of the eighth-floor, by screw-bolts ¾-inch in diameter, to which the lantern and light-room are bolted. The gallery railing consists of wrought-iron ballusters, 1¼ inch in diameter, fixed at intervals of 6 inches, and fitted with a rail at the top, 2½ inches wide by ⅝-inch thick. The height from the gallery to the centre of the light is 11 feet, and from the centre of the light to the top of the vane is 17 feet; making the total height of the lighthouse 378 feet 9 inches above the level of high water.

It has been calculated that the light could be seen from the deck of a vessel at the distance of 26 or 27 miles, though, under certain conditions of the atmosphere, it would be visible at a still greater distance, and this at all points of the compass, excepting where obscured by the high land to the north and east, between Gibb's Hill and Castle Harbour.

Much unnecessary delay was occasioned in the erection of this lighthouse, in consequence of the Board of Ordnance appointing a new commanding-officer of Royal Engineers stationed at Bermuda, and as the work had to be erected under his directions, and he had to come from head-quarters to his post, to approve of the site selected and of the work as it progressed, under the immediate superintendence of Mr. Grove (Mr. Gordon's assistant), such delays occurred from this Government system, that three years were required to do work that might have been accomplished in twelve months. The first parts of the lighthouse were landed in Bermuda about the end of November, 1844, and no time being then lost, the first plate was erected on Gibb's Hill on the 19th of December, 1844, and the last plate of the tower on the 9th of October, 1845.

By a Parliamentary return, the following is shown to have been the cost of this lofty lighthouse, constructed in so short a time, and in so tempestuous a locality:

	£	s.	d.
Sums paid to the Trinity Board for the optical apparatus, to Messrs. Wilkins for the lantern, and to Messrs. Cottam and Hallen for the ironwork of the tower in England (where the whole was first erected), including all tools, materials, and freight	£5,436	16	8
Total cost in Bermuda for materials, labour, resident engineer, &c....................................	2,252	5	10
	£7,689	2	6

The annual expense of maintaining this lighthouse is estimated to be about 450*l.*; the consumption of oil is eighteen pints per night.

Besides the immediate benefits conferred by this lighthouse on all shipping approaching the Bermudas, it has also been the means of effecting a beneficial change in the habits and morals of the inhabitants. Owing to the numerous and very dangerous rocks and shoals with which the Bermudas are surrounded, shipwrecks were so frequent, previous to the erection of the lighthouse, that the inhabitants gained their livelihood almost entirely by wrecking; whilst agriculture was wholly neglected, although the soil is naturally very rich and fertile. Since the light has been exhibited, there has not been a single shipwreck, and consequently the inhabitants, finding their former occupation at an end, have been compelled to return to the cultivation of the land, as a means of subsistence; so that the islands now produce oranges and other fruits of the finest description, and in great abundance, as well as contributing some of the best productions for the pharmacopœia.

Discussion. — Mr. Alexander Gordon said, that owing to the difficulties of the situation, the frequent recurrence of storms in the Bermudas, and the scantiness of the pecuniary means, it was necessary that the lighthouse should be expeditiously executed, and at a small cost; but yet that it should be capable of resisting the destructive force of the hurricanes. Though the lighthouse in question was one of the loftiest which had ever been constructed, and exhibited a light of the most powerful kind, its entire cost, including the trial erection in England, the freight to Bermuda, and the re-erection on Gibb's Hill, was less than 8,000*l.* This amount was very small; indeed, he was not aware of any great sea-light having been erected, in any part of the world, at so moderate a cost. Cast-iron lighthouses were, he believed, first proposed by Captain Sir Samuel Brown, R.N.; but the small light tower on the Town Pier at Gravesend, constructed by Mr. Tierney Clark, was the first absolutely erected, though Mr. Walker had previously introduced iron lanterns for lighthouses. The first great sea-light, on an iron tower, was that erected by Mr. Gordon, on Morant Point, Jamaica, at the extremity of the low swamps which formed the eastern end of that island; this position was very difficult of access, and was also extremely unhealthy for European workmen. The frequent shocks of earthquakes in that island having hitherto prevented the erection of any structure exceeding two stories in height, it occurred to him that a lighthouse for such a site should be self-supporting, and should

therefore be treated as a very large lamp-post; and that the engineer, instead of attempting to build a monument for himself, should design and execute the work with an especial view to economy. It had been recorded in the *Jamaica Almanack* for 1844, that this lighthouse had several times withstood the shocks of earthquakes and violent storms of lightning, which were, of course, rendered perfectly harmless by the conducting power of so large a surface of metal. He had employed this system of building lighthouses, with a core of masonry or concrete in the inside, for some height upwards from the base in several other instances, notwithstanding the objections of Mr. Alan Stevenson, who thought that there would be an expansion and contraction of the metal, and a change going on at the base of the structure, which would destroy its stability. Mr. Gordon, however, considered that opinion erroneous, because the metallic shell or case insured a perfect bond, which, with the weight of the core, would securely retain the lighthouse on its site. He was so convinced of the correctness of this principle, that he had recommended it for the consideration of the home government, for a lighthouse on a half-tide rock at Simon's Bay, in South Africa. He objected to building a lighthouse in such a situation on piles, or on an open framework, similar to those at Fleetwood and on the Maplin Sands, because if the piles or open framework were of wood, the worm or the rot would be liable to cause the destruction of the erection; and if the piles were of cast-iron, they would be exposed to the effect of the chemical action of the salt water, as well as to the heavy blows of the waves, which, being given to the respective supports at different times, would cause great irregularity in their vibrations. It was, in his opinion, to this cause that the destruction of the beautiful structure erected on the Bishop Rock, at the entrance of the British Channel, must be attributed. One of its cast-iron limbs had, doubtless, been struck by a heavy sea, thereby putting it into a state of vibration, differing in amplitude and intensity from that in the other limbs, which would just bring it into the most favourable condition for breaking cast-iron. In answer to observations from Mr. Saunders as to the advantages of the use of wrought-iron in the columnar supports of lighthouses, such as the Maplin Sand, Mr. Gordon said there was no necessity for giving any opinion on the subject of Mitchell's screw-piles, nor did that excellent system require him to do so. It, as well as Dr. Potts' system of sinking a foundation, had both been tried to a considerable extent by the Corporation of the Trinity-house; but as neither of those systems were referred to in the paper before the meeting, he had merely intended his observations to allude to the difficulty of founding a metallic lighthouse of wrought or cast iron, or gun-metal, upon rocks above or under water, and exposed to the action of the sea. Although he had erected several iron lighthouses, they had hitherto been founded on granite, coral, hard sandstone, or slate rocks, and he would not build with cast iron under high-water mark, unless the core was of such a hard and durable character as to stand alone, in case of the exterior shell being changed into carburet of iron. He hoped soon to be able to communicate to the Institution the results of founding a lighthouse, several feet under water, upon compact limestone; at present he had not determined whether the external shell of the base of the tower should be formed of gun-metal plates, or of lead slabs; but in either case he wished to obtain great inertia, as well as a strong and tight outer bond to resist the action of the sea. He knew little on the subject of the preservation or expenditure of stores in any of these lighthouses. In one lighthouse constructed under his directions the stores and attendance cost as much as 1,600*l.* a year, whilst in that referred to in the paper it was only about 400*l.* per annum, although the latter consumed more oil; yet he supposed them both to be managed according to his own recommendations. These, and many similar discrepancies, showed that the whole subject of the erection and maintenance of the colonial lights required great and prompt attention from the home government; for although Great Britain had 147 colonial lighthouses, there was, he believed, no regular system of management, and no collection of statistical facts connected with them, nor was there any department of the public service where such necessary information was collected, tabulated, and registered, and from whence any person might obtain information with respect to such lighthouses.

Sir John Rennie believed that a cast-iron structure had been originally proposed by Captain Brodie for the Bell Rock Lighthouse, and it had been favourably reported on by Mr. R. Stevenson.

Mr. Borthwick said, Sir S. Brown proposed the first tower entirely of cast iron; the lighthouse designed by Captain Brodie and Mr. Stevenson was intended to have been an open structure on piles. The pamphlet published by Sir S. Brown, describing his proposed lighthouse, contained a valuable opinion by Dr. Faraday as to the chemical action of salt water on cast-iron.

Mr. Gordon said it was to be regretted that

so little was now known of Rudyerd's lighthouse built on the Edystone Rock in the year 1708, which was about forty-eight years before Smeaton commenced building the present lighthouse; it was constructed entirely of wood, loaded for some height upwards from the base with stone, and fastened down by strong iron dovetail-ties leaded into the rock: it stood well for forty-seven years, subject to the action of the sea in that exposed situation, and was ultimately destroyed by fire.

Mr. Walker said, that before replying to Mr. Gordon's observations on the columns for the intended lighthouse upon the Bishop Rock, he would direct attention to a remarkable wooden lighthouse, erected in 1778, and now standing on the Small's Rock, off St. David's Head, and which was in a more exposed position than even the Edystone. The height was 56 feet from the top of the rock, and it consisted of nine oak piles, secured to the rock in a nearly vertical position with four raking shores against the easterly pillars, forming the main support of the building during the westerly storms. Although it was exposed to the whole force of the Atlantic, it had stood for upwards of sixty years, and indeed the wooden standards were affected so little, that the erection was now quite as secure as it had been for some years past. Considering the violence of the sea, it was a wonder the building had stood so well, as from the size of the piles, and their closeness to each other, the resistance to the sea is considerable. During a violent storm in the spring of 1831, a great part of the flooring of the dwelling was forced up, and the stove in the living-room squeezed flat, between which and the side of the dwelling one of the keepers, named Lewis, was jammed, and so much injured that he had to be superannuated, but he died two years afterwards. Two sides of the octagon living-room were also forced in, so that the victuals had to be cooked by the flame of the lamps for eight days, which was the period that elapsed between the commencement of the storm and the time when a landing could be effected on the rock. With regard to the Bishop Rock Lighthouse, it must be remembered that the structure was in a very incomplete state when the workmen left it to stand through a winter, so that it was not at all prepared to resist so violent a storm as that of the 5th and 6th of February, 1850, by which it had been destroyed. At present there was no correct account of the state in which the storm had left it, as no one had since been able to land on the rock; there was, however, no doubt that, at least, the upper part of the columns had been carried away. He wished Mr. Gordon had exercised a little more patience, and had not brought the subject forward in Mr. Walker's absence, nor until it had been possible to ascertain its actual condition, in order that the Institution might have been more accurately informed of the extent and nature of damage the structure had received. Immediately after the accident had been announced, the Trinity-house, at Mr. Walker's request, had sent down Mr. Douglas, who erected the building; but no communication had yet been received from him.* Mr. Walker would, however, be happy to give any information in his power to the Institution, because he thought it was perhaps more important than the profession should be acquainted with those attempts which had failed, rather than with those which were successful. With respect to the resistance of the action of the sea, it was proper to observe that in consequence of the approach of bad weather, the central column, which was 3 feet 6 inches in diameter, had not been filled up, as had been intended. The first operation in the ensuing spring would have been to have inserted the inner pipe, which was to form a tank for water, and also to strengthen the lower part of the building. The space between the inner and the outer pipe was also intended to have been filled up with concrete, so as to form a solid mass for 20 feet above the surface of the rock; if these and some other alterations had been effected, it was not improbable that the building would have been enabled to withstand the storm, even in its unfinished state, and the experiment would have terminated more satisfactorily. Economy had been one of the main objects of the Trinity Board, for the cost would not have been more than one-sixth to one-tenth part of that of a stone building. As engineer to the Trinity Board, he proposed a building entirely of granite or of stone up to a height of 20 feet or 30 feet above high-water mark, with a superstructure of cast-iron; but the corporation preferred one entirely of cast iron, and determined to try the experiment. The arrangement was to allow the cast-iron columns to stand during the winter, in order to test their strength; and it was to be lamented that there was not time to com-

* Mr. Douglas succeeded in reaching the rock on Sunday, the 24th of February, 1850, when he found all the cast-iron columns and the internal wrought iron rods had been broken off at different heights, varying from 1 foot to 6 feet from the surface of the rock; but that all the points of attachment remained uninjured, and the rock itself was not torn up.—*Sec. Inst. C.E.*

plete the centre column, for even in its unfinished state it had resisted the storms up to the 6th of February. A few weeks before that period, the rock had been visited, at his desire, when the piles were found standing as perfect as when they were left at the end of the previous summer—a proof that nothing less than a very severe storm could damage the columns, even in their unfinished state. The work had been well put together by Messrs. Robertson and Son, of Pimlico. Inside each column there was a wrought-iron bolt, 4 inches in diameter, with its dovetailed end sunk into the rock, to a depth of 15 inches below the bottom of the columns; this bolt gradually diminished to 3 inches at the top, where it terminated with a nut and screw, and the space between the bolt and the column was filled-in solid with iron cement, so that each was firmly tied down to the rock. Although he thought any discussion was premature, in the present state of information, as to the actual condition of the structure, he was desirous of imparting to the Institution even the imperfect information he had been enabled to collect. The original drawing of the building had been altered and strengthened when it was sent to Mr. Walker by the Trinity-house; and although he did not design the structure, and should have preferred a stone building, still he would not have been connected with it at all, unless he had expected the iron lighthouse would have succeeded. The Maplin and the Point of Ayr lighthouses were both columnar structures. The former was erected in the year 1838-9, on a sand-bank, and was supported on Mitchell's screw-piles, with wrought-iron standards, which formed the best foundation in such localities. The Point of Ayr lighthouse was a modification of that system, which had been adopted because an agreement could not be effected with the then proprietor of the patent; both lighthouses had stood perfectly well, and under similar circumstances he should always adopt the system of screw-piles.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING AUGUST 10, 1852.

EDWARD HIGHTON, of Clarence-villa, Regent's-part, civil engineer. *For improvements in electric telegraphs.* Patent dated January 29, 1852.

Mr. Highton's invention comprehends,

1. An improved construction of key for telegraphic purposes, which is so arranged that one spring only is employed in lieu of two, as usual.

2. Two arrangements of alarums for telegraphic purposes.

3. The preparation of paper or fabrics to receive impressions in the chemical printing telegraph with a liquid or material susceptible of assuming one colour when acted on by a negative current of electricity, and another colour when acted on by the positive current, the combination of the two colours being used to make a code of signals.

4. A method of suspending telegraphic wires from their supporting posts by arms placed obliquely to the posts, instead of vertically or horizontally.

5. The use of hydraulic power for tightening the wires between the supporting posts.

6. Another method of tightening the wires by bringing them into zig-zag lines between the posts.

7. The use of an earth connection for each of the wires of a line of telegraph between the wires and the point of support.

8. A method of suspending telegraphic wires, and insulating them at the point of support. The wires are first coated with varnish for a length of about two feet on each side of the supporting point; they are then bound round with varnished silk, and are finally enclosed in gutta percha about half an inch thick. The wires are suspended from the post by hook-shaped clamps of galvanised iron.

WILLIAM SMITH, of Kettering, Northampton, agricultural implement maker. *For improvements in apparatus for cutting or breaking lump sugar and other vegetable substances.* Patent dated January 29, 1852.

Mr. Smith's improved apparatus is provided with two cutters, each of the shape of two sides of a square, or a cross, one being fixed, and the other moveable. The moveable cutter is attached to a stem working in a guide, and moved up and down above the lower cutter by the action of a treadle and connecting rods. The sugar or substance to be cut is laid on the lower cutter, and supported by a rest, the amount of feed being determined by a stop; when the descent of the upper cutter is effected, the working of the treadle and the severance of the material instantly takes place. The sugar falls on an inclined screen, which conducts it to a suitable receptacle, and at the same time allows the dust to pass through to a separate receiver underneath.

Claims.—1. The general arrangements of machinery and apparatus set forth and shown in the drawings.

2. The mounting of the moving knife or knives of such machinery on a stem working

in a fixed guide or socket, or on a pair of stems similarly fitted.

3. Communicating the reciprocating motion of a treadle to the moveable knife or knives of such machinery by means of a jointed connection, of which a crank pin is the centre of motion.

4. The means whereby the feeding-in of the material to be submitted to the action of the knives of such machinery is regulated.

JOSEPH MAXIMILIAN RITTER VON WINIWARTER, of Surrey-street, doctor of law. *For certain improvements in the locks of fire arms and cannon, and in gun matches, or in the mode of igniting gunpowder used in guns, and in machinery for manufacturing the same.* Patent dated January 29, 1852.

This invention consists of the following improved compositions for making gun-matches.

First Composition.

300	parts	Fulminating mercury.
288	,,	Chlorate of potassa.
312	,,	Sulphate of antimony.
60	,,	Charcoal and saltpetre (mixed in the proportions of 16·7 parts of charcoal to 63·3 parts of saltpetre).
23	,,	Ferrocyanide of potassium.
6	,,	Binoxide of lead.
900	,,	Etheroxylin (containing 75 parts of pyroxylin to 150 parts of ether).

Second Composition.

75	parts	Fulminating zinc.
4	,,	Chlorate of potassa.
7	,,	Sulphate of antimony.
15	,,	Binoxide of lead.
224	,,	Etheroxylin.
1	,,	Ferrocyanide of potassium.

Third Composition.

75	parts	Amorphous phosphorus.
64	,,	Binoxide of lead.
15	,,	Charcoal and saltpetre.
106	,,	Etheroxylin.

In preparing the above compositions the ingredients are placed in a finely-powdered state in a mixing machine, which consists of a horizontal cylinder, divided into two parts by a perforated plate, and having two pistons working in it, by which the materials are forced through the plate, first in one direction and then in the other, until thoroughly mixed. The composition is then moulded into matches of a conical shape, and of rather less diameter than an ordinary percussion cap, when dry the matches are ready for use in the same manner as caps and as substitutes for them. In order to fit gun-locks for use with such matches, the nipple has a conical recess formed in it, into which the match is introduced.

The "etheroxylin" above-mentioned is prepared by mixing one and a half parts by weight of cotton wool, paper maker's pulp, or sawdust, with a liquid composed of twelve parts by weight of sulphuric acid, of sp. gr. 1·815, and six parts of nitric acid. After remaining at rest for about six hours, the fibrous material is cleansed with water to remove the superfluous acid, and carefully dried. The product thus obtained is "pyroxylin" which is moistened with spirits of wine, according to the degree of etherization required, and when dissolved, is ready for use as above described.

Claims.—1. The several compositions in the proportions described.

2. The mixing machine having a perforated plate.

3. The mode of forming the matches.

4. The mode of preparing the etheroxylin.

WILLIAM LONGMAID, of Beaumont-square, gentleman. *For improvements in obtaining gold.* Patent dated January 30, 1852.

Mr. Longmaid's process for obtaining gold consists in fusing the quartz or other stony material containing the same by the addition of suitable fluxes, such as lime, fluor-spar, alkali, iron pyrites, &c., when the gold, by its gravity, is precipitated to the bottom of the melting furnace, or its separation accelerated by placing on the bed of the furnace metallic iron; pieces of old boiler plate answer for this purpose. The gold is afterwards detached from the boiler plate by immersing the same in molten lead, and may be obtained from the lead by the ordinary process of cupellation.

RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Company, of 166, Fleet-street, London, patent agents. *For improvements in the purification and decoloration of oils, and in the apparatus employed therein.* (Being a communication.) Patent dated January 31, 1852.

Firstly.—This invention consists of an improved method of purifying and decolouring cotton oil. For this purpose an apparatus of the following construction is employed. It consists of a double-sided vessel, the interior chamber of which is appropriated to holding the oil to be purified, and the outer, which may be called the jacket, to the steam by which the oil is heated. There is a pipe by which steam is supplied to the jacket and a steam-escape pipe. There is also a second steam-supply pipe, which leads to a steam box or chest, which fits on to the top of the oil

chamber. To the bottom of this steam box are attached a number of open tubes, which serve to convey the steam to the bottom of the oil chamber, whence it forces its way upwards in a number of minute streams amongst the oil. Opposite the mouth of the second supply-pipe, where it opens into the steam box, is placed a flat plate for the purpose of dispersing the inflowing steam towards the tubes. Hot air, or any other aëriform fluid containing oxygen, may be substituted for the steam. The tubes are of small diameter, and from 2 to 3 inches apart; but they may be of any form, as straight, or spiral, and disposed in any manner whatever, provided always they are in sufficient number to divide the inflowing steam, hot air, or other fluid, into a great many minute streams or currents. Supposing cotton oil to be that required to be purified, there is to be added to every 220 lbs. weight of oil introduced into the oil chamber about eighty-seven and a half pints of sea water (of the density of 11 lbs. of salt in every hundred and seventy-five pints of water, or thereabouts); and then the communication between the steam-supply pipe, and the steam box being opened, the mass is left to the action of the heat and steam upon it for two hours. One and three-quarters of a pint of hypochlorite of soda or potash is then thrown in, and after the lapse of about thirty minutes, from 2 lbs. to 4 lbs. of hydrochloric acid, or in lieu thereof, three and a half ounces of hydrofluoric acid. In from five to ten minutes more the oil is drawn off and filtered, and then transferred to a wooden vat, in order to undergo a course of mechanical agitation, but previous thereto about one hundred and seventy-five pints of water (which may be either warm or cold), and a lye of three and a half pints of hypochlorite of soda or potash are added. The vat turns on a vertical shaft or spindle, which is furnished with a number of radial arms, which, during its revolution, pass between a series of rods or pins, which project inwards from the sides of the vat. There are also several vertical pins which project downwards from the lowest of the radial arms (passing clear of the bottom of the oil chamber), so that the mass of oil is broken up and tossed about in all directions, by the action of the agitator. A very rapid rotation of the agitator is not necessary; but it must be kept going until the decoloration of the oil is apparent, which, if the rate amount to from seven to fifteen revolutions a minute, will be generally in about an hour, but if the quantity of oil be larger, the rotation may be more rapid.

Or, instead of the method just described, the cotton oil may be purified and decoloured by the following cold process alone, combined with mechanical agitation. In this case a wooden vat fitted with an agitatator similar to that last mentioned, is employed, and there is added to every 220 lbs. of oil from 4½ lbs. to 6¼ lbs. of soda, or caustic potash, or bluestone (pierre à cautère) dissolved in thirty-five pints of water. The agitator is kept going for about an hour, afterwards the mass is allowed to settle, and the supernatant fluid drawn off and filtered. Should the oil be slow in coming to a fluid state, the operation may be expedited by passing steam through a coil of piping or hose laid in the vat; and time will also be saved by increasing even to the extent of doubling the quantity of chemical re-agents employed.

Secondly.—The invention consists of an improved method or methods of purifying and decolouring palm oil. This oil is subjected to the action of numerous streams of injected steam, or hot air, or other aëriform fluid containing oxygen, by means of an apparatus precisely similar to that before directed to be used for the purification of cotton oil, but there are first added to every 220 lbs. of the oil about 2 lbs. 3 ozs. of either hypochlorite of soda, or potash, or chlorine, or a lye formed of a solution of 2 lbs. 3 ozs. of bicromate of potash in eighty-seven and a half pints of water, and after the oil has been exposed for about an hour to the action of the streams of steam or hot air, or other aëriform fluid, and of the chemical agents introduced as aforesaid, a further addition is made to the mass, of from 2 lbs. to 4½ lbs. of hydrochloric acid. It may also with advantage be mixed with the solution of bichromate of potash.

Or, the method following may be adopted for the treatment of palm oil: a circular-iron vat is employed, provided with an agitator, and such appliances as may be necessary to give that agitator any degree of rapidity of rotation which may be desired (which appliances any workman of competent skill can readily supply). The axis of the agitator may be made hollow, so as to serve as a channel for the agitation of steam, hot air, or other aëriform fluid. To every 22 lbs. of the oil to be purified there is added about three quarts of a lye, composed of 1 lb. of wood ashes for thirty of water, or three quarts of hypochlorite of soda or potash, the temperature of the mass is then gradually raised from 150° to about 300° Fahr.; and finally, the agitator is put in motion at the rate of from 50 to 500 revolutions a minute. In less than an hour afterwards the purification and decoloration will be found complete, or nearly so. The rapidity of agitation in this case is of essential im-

portance, for in proportion to the number of revolutions made by the agitator in a given time, will be the quantity of steam or hot air, or other aëriform fluid forced through, and consequently the quantity of oxygen absorbed or come in contact with during that time. If this oil were naturally liquid, it could be bleached simply by such rapid mechanical agitation as the above; but the ingredients which impart its colour to it being both solid and volatile, it becomes necessary to keep it during the entire operation in a state of fusion, which is done partly by the heat derived from the steam jacket, and partly by the heat arising from the injected currents of steam or hot air, or other aëriform fluid.

Another method, which is sometimes adopted to bleach palm oil, is to subject it in a close vessel to a temperature of from 240° to 320° Fahr., and pass hot or cold air through it by means of a perforated pipe, introduced at one side of the vessel, and fitted with a regulating valve at the opposite end.

After the oil has been treated by any of the three methods last described, there is usually added two per cent. of chlorine, more or less according to the degree of colour still exhibited by the oil, and it is then exposed in shallow pans to the light and air until every trace of colour disappears. The employment of chlorine alone will suffice without the aid of any of the other operations before described, to effect the complete discoloration, but not so expeditiously.

Linseed and rape oils can be depurated like palm oil, by heat alone, provided always the temperature is not allowed to exceed 194° of Fahr.

Thirdly.—The invention consists of certain improved methods of treating cacoa-nut oil. To every 220 lbs. by weight of the cocoa oil, are added 4½ lbs. of hydrochloric acid, or one and three-quarters of a pint of a solution of storax calamile, or from 1 lb. to 2 lbs. of chlorine, and the mixture is subjected to the action of injected streams of steam, hot air, or other aëriform fluid, in an apparatus of the same description as that first described, till the purification and disinfection are effected, or the same result may be obtained by applying to the cocoa-nut oil, the same process of agitation which is before described, and employing as the chemical re-agent about three and a half pints of hydrocloric acid for every 220 lbs. of oil.

The same processes are equally applicable to the treatment of linseed, rape, and most other vegetable oils, with this difference, that you may then employ either acids, or hypochlorites indifferently. When acids are used, the hydrochloric is in all cases preferred, using for every 220 lbs. of oil, about 4½ lbs. of the acid. When hypochlorites are had recourse to, any quantity of hypochlorite of potash will have double the effect of twice the quantity of hypochlorite of soda. I have used with great success from three and a half to seven pints of a lye, composed of one part of wood ashes to thirty parts of soda for every 220 lbs. of oil.

Fourthly.—The invention consists of certain improvements in purifying and decolouring olive oil. This oil is first heated in a cold state with hypochlorite of soda or potash, or with chlorine, and then subjected to mechanical agitation for an hour or two. If the oil is of a very fœtid kind, as that coming from the Levant and Tunis, commonly is, there should be added to every 220 lbs. of the oil, about 4½ lbs. of hydrochloric acid, or of chlorine, and the mixture subjected to the action of injected streams of steam, hot air, or other aeriform fluid, in apparatus similar to that firstly before described. The oil becomes under such treatment completely depurated in two or three hours.

Fifthly.—The invention consists of certain improvements in the purification and discoloration of fish oils. The whole of this class of oils, with the exception of whale oil, are treated by the same cold process or processes, as have been before directed, to be used in the case of certain of the vegetable oils, after which, in order to deprive them of their offensive odour, there is added to every 220 lbs. of the oil, about 4½ lbs. of hydrochloric acid, and the mixture is subjected to the action of injected streams of steam, hot air, or other aëriform fluid, in an apparatus, such as has been already described. In the case of whale oil, besides subjecting the oil to the action of injected streams of hot air, or other aëriform fluid, as aforesaid, there is added, at half hour intervals, (to every 220 lbs. of the oil) one and three-quarters of a pint of the solution of azotic acid, one and three-quarters of a pint of dilute oxalic acid; 2 lbs. of dilute hydrochloric acid (divided into two or three doses) and from 2 lbs. to 4 lbs. of chlorine.

All the before mentioned processes, or at least with slight modifications only, may be applied effectively to the purification and decoloration of mineral oils, such as those of naphtha, shael, petroleum, &c. But it must be observed, of all oils of whatever sort which have been treated with acids, that the acids must be ultimately washed out of them (before use), by hot or boiling water.

In those cases where a minute subdivision of the injected streams of steam, hot air, or other aëriform fluid is of importance, as in

the second process before given for the purification of palm oil, there might be substituted with advantage for the vertical injection tubes, two, three, or more diaphgrams, or discs of wire gauze, or perforated metal, inserted crosswise into the oil chamber, the meshes of which would have precisely the same effect in the separation of the inflowing streams, as if they were so many tubes.

Claims.—1. The method of purifying and decolouring cotton oil before described, in so far as regards the combination therein of heat and certain chemical re-agents with mechanical agitation, and the employment for the purpose of the particular apparatus as before described, or any modification thereof.

2. The cold process of purifying and decolouring cotton oil before described, in so far as regards the mode therein followed of combining mechanical agitation with chemical re-agents.

3. The first of the methods of purifying and decolouring palm oil before described, in so far as regards the employment therein of a combination of injected streams of steam, hot air, or other aëriform fluid, with heat and certain chemical re-agents.

4. The second of the methods of purifying and decolouring palm oil before described, in so far as regards the mode in which mechanical agitation and certain chemical re-agents are there combined with heat (indirectly applied), and a rapid injection of streams of steam, or hot air, or other aëriform fluid into, and through the oil to be purified.

5. The method of treating cocoa-nut oil before described, in so far as regards the combination of injected streams of steam, hot air, or other aëriform fluid with the chemical re-agents employed.

6. The method of treating olive oil before described, in so far as regards the re-agents employed for the purpose and their combination with mechanical agitation.

7. The method or methods before described, of treating fish oils (whale oil included), in so far as regards the particular re-agents employed for the purpose, and the injection in numerous minute streams of steam, or hot air, or other aëriform fluid, into, and through the same.

8. The employment of diaphragms or discs wire gauze, or perforated metal for the method of passing steam, hot air, or other aëriform fluid in numerous minute streams through oils requiring to be purified.

9. The application of each of the methods or processes which have been before described, and claimed in respect of certain specified oils, to all other oils to which the same may be applicable.

Alexander Hediard, of Rue Taitbout, Paris, gentleman. *For improvements in propelling and navigating ships, boats, and vessels by steam and other motive power.* Patent dated January 31, 1852.

Claims.—1. The construction of an apparatus in which the external water, received through an ingress orifice, is projected through an egress orifice, of smaller dimensions, against the outer water in any required direction for the propulsion and navigation of ships, boats, and vessels.

2. Regulating the volume and velocity of the projected jet of water by means of plates of various dimensions adapted to the egress orifice.

William Squire, of High Holborn, pianoforte-maker. *For improvements in the construction of pianofortes.* Patent dated January 31, 1852.

Claims.—1. A mode of compensating for the varying sensible weight of the hammer of pianofortes, or that weight which is appreciable to the touch of a performer.

2. Taking advantage of the sensible weight of the damper for reinstating the jack or hammer-lifter in the notch of the hammer.

3. Weighting the keys or key-levers in both upright and horizontal instruments.

4. A mode of applying the principle of gravitation for reinstating the jack or hammer-lifter in the notch of the hammer in horizontal instruments.

5. A mode of applying metal bars as a bracing in both upright and horizontal instruments.

Joseph Haythorne Reed, of the Harrow-road, gentleman. *For improvements in propelling vessels.* Patent dated Jan. 31, 1852.

Mr. Reed's propeller consists of two frames, of a rectangular shape, attached to vertical axes at the stern of a vessel. The frames are divided into two or more parts lengthwise by rods, to which are hung floats, the lengths of which correspond to that of the frames. The axes of the frames are made hollow, and within them are other axes, to which are fitted catches, which can be turned so as to act on either side of the suspended floats, and prevent their moving except in one direction. This gives them, when the shafts are set in action, a swinging, or, as the patentee terms it, a "valvular" motion. By turning the axes so as to bring the catches to bear on the opposite side of the floats in the frames, their action will be reversed.

Claims.—1. The vertical axes as a substitute for the horizontal ones of paddle and screw propellers as hitherto used.

2. The plane paddles, as a substitute for the circular or other paddles and screw.

3. The valve principle of planes moving

in one direction only, as applicable to paddles generally, for the propulsion of vessels.

4. The general construction and combination of parts shown, for the better propulsion of ships and other vessels.

OWEN WILLIAMS, of Stratford, engineer. *For improvements in preparing compositions to be used in railways and other structures in substitution of iron, wood, and stone.* (A communication.) Patent dated January 31, 1852.

This invention consists in certain modes of manufacturing compositions to be used for railway construction and building purposes generally. The following are the proportions of ingredients used in preparing one such composition:

180 lbs. pitch.
4½ gals. dead oil or creosote.
18 lbs. rosin.
15 lbs. sulphur.
45 lbs. finely-powdered lime.
108 lbs. gypsum.
27 cubic feet sand, breeze, scoria, bricks, stone, or other hard materials broken to pieces, and passed through a half-inch sieve.

The sulphur is first melted with about 30 lbs. of the pitch, after which the rosin is added, and then the remainder of the pitch with the lime and gypsum, which are introduced by degrees and well stirred, and the mixture brought to boil. The sand, or broken earthy or stony material is then added, and the whole mass well stirred, after which the dead oil is mixed in, and the composition is in a fit state to be moulded into blocks. In order to consolidate the blocks, pressure is applied to them in the moulds. The patentee gives also the proportions of the above materials to be used as a composition for laying pavements, as a cement for uniting to each other blocks of the first-named composition when used for building purposes, and as a coating for bridges, the roofs of buildings, &c.

In conclusion, he observes, that the proportions above stated may be varied without departing from the invention, which consists in the modes of preparing such compositions, and particularly in the use of sulphur therein.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For improvements in machinery for weaving coach-lace, Brussels, tapestry, and velvet carpeting, and other piled fabrics.* (A communication.) Patent dated January 31, 1852.

This invention consists—1. Of improved arrangements for actuating the pile wires of certain weaving machinery patented in the name of Mr. Newton, in 1849; and 2. Of improvements in effecting the cutting of the pile loops when cut-pile fabrics are to be produced.

PETER CLAUSSEN, of Gresham-street, London, gentleman. *For improvements in the manufacture of saline and metallic compounds.* Patent dated February 3, 1852.

1. This invention, as far as it relates to the manufacture of certain saline compounds, such as the nitrate of potash, consists in the treatment of ammonia, and certain ammoniacal compounds evolving ammonia, in such manner that the volatile alkali may suffer decomposition and oxidation, so that certain nitracids, and especially nitric acid, may be formed. Care is to be taken to present to the nascent nitracid some suitable basis, such as lime, potash, or soda, in order that nitrate of lime, potash, or soda, may be produced.

To assist the oxidation of the ammonia, an apparatus is employed in which is placed pumice-stone, coke, charcoal, platinum foil, spongy platinum, or other bodies presenting an extended surface possessing the property of absorbing large quantities of oxygen. The ammoniacal liquid is allowed to pass over the surfaces of the spongy platinum, for example, and is then in its oxidated state allowed to come in contact with some suitable base with which it will form a nitrate.

If an ammoniacal salt, such as the sulphate of ammonia, is employed, some suitable body should be presented to the salt with which the acid will combine, setting the ammonia free—thus lime may be used for such a purpose. The part of the apparatus in which this change takes place must be closed up, so as to prevent the escape of the liberated ammonia into the air. The ammonia being absorbed by water, is next allowed to drop on to the oxidating surface of the spongy platinum or pumice-stone, and then again into a solution of the base of the future nitrate.

By a modified arrangement of apparatus, this process may be employed in the nitrification of the ammonia obtained in the distillation of coal at gas-works, whereby useful and valuable nitrates may result at once.

2. The invention, as far as it relates to the manufacture of soda, salts, and especially of the hydrate and carbonate of soda, consists in the conversion of sulphate of soda, whether made directly or produced as a residuum, into caustic soda and carbonate of soda.

Thus, to a solution of sulphate of soda, the patentee adds a proper proportion of some substance, which having a greater affinity for sulphuric acid than soda, will decompose that salt, and set the soda free. Thus the hydrates of lime of baryta, or strontia, may be employed, by means of which sulphates of lime, baryta, or strontia, will be formed, and hydrate of soda be left in solution. By long exposure to the atmo-

sphere, especially if attended by agitation, carbonic acid will be absorbed, and the hydrate of soda will become a carbonate, and may be crystallised. The application of heat to the liquids facilitates the decomposition.

The patentee also maufactures carbonate of soda, as well as hydrate of soda, directly from common salt, by the decomposition of that substance by means of certain organic acids which are afterwards decomposed by heat; by gaseous acids capable of decomposing chloride of sodium; by the decomposition of common salt by hydrates, oxides, peroxides, and certain metallic bases; also by certain carbonates—carbonate of ammonia excepted.

Claims.—1. The method of oxidation and combination of ammonia with alkaline and earthy bases for the purpose of forming nitrates. And

2. The formation of caustic soda and carbonate of soda by the double or decomposition of sulphate of soda, or of chloride of sodium.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Alfred Vincent Newton, of Chancery-lane, for improvements in the manufacture of metallic fences, which improvements are also applicable to the manufacture of verandahs, to truss frames for bridges, and to other analogous manufactures. (Being a communication.) August 7; six months.

Roger Hind, of Warrington, engineer, for certain improvements in the construction of machinery or apparatus applicable to weighing machines, weigh bridges, railway turn-tables, cranes, and other similar apparatus. August 7; six months.

Alexander Mills Dix, of Salford, Lancaster, brewer, for certain improvements in artificial illumination, and in the apparatus connected therewith, which improvements are also applicable to heating and other similar purposes. August 7; six months.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of Fleet-street, patent agent, for improvements in the manufacture of manure. (Being a communication.) August 10; six months.

Edward Joseph Hughes, of Manchester, for improvements in machinery or apparatus for spinning and weaving cotton, wool, and other fibrous substances, and also in machinery or apparatus for stitching either plain or ornamentally. August 10; six months.

Robert Weare, of Plumstead-common, Kent, electrical engineer, for improvements in galvanic batteries. August 12; six months.

Melchior Colson, of Finsbury-square, Middlesex, civil engineer, for certain improvements in the construction of vehicles. August 12; six months.

Daniel Adamson and Leonard Cooper, of Newton-wood Iron-works, near Hyde, Cheshire, for certain improvements in the construction of steam-engines and steam boilers, also in the method of using and rarefying steam, part of which improvements are applicable to marine locomotive and other boilers, and marine architecture in general, as well as in cisterns, tanks, and articles of a like nature. August 12; six months.

Richard Laming, of Millwall, Middlesex, chemist, for improvements in the manufacture and the burning of gas, in the treatment of residual products of such manufacture, and of the distillation of coal, or similar substances, and of the coaking of coal. August 12; six months.

Nathaniel Jones Amies, of Manchester, manufacturer, for certain improvements in the manufacture of braid, and in the machinery or apparatus connected therewith. August 12; six months.

Francois Bernard Bekaert, of Cecil-street, Strand, for improvements in the manufacture of zinc white. (Being a communication.) August 12; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
August 6	3348	J. Lee	Birmingham	Combination gold-digging tool.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

August 7	451	A. E. L. Bellford	Castle-street, Holborn	Night lamp.
,,	452	M. A. Baudit	Castle-street, Holborn	Ink-stand.

CONTENTS OF THIS NUMBER.

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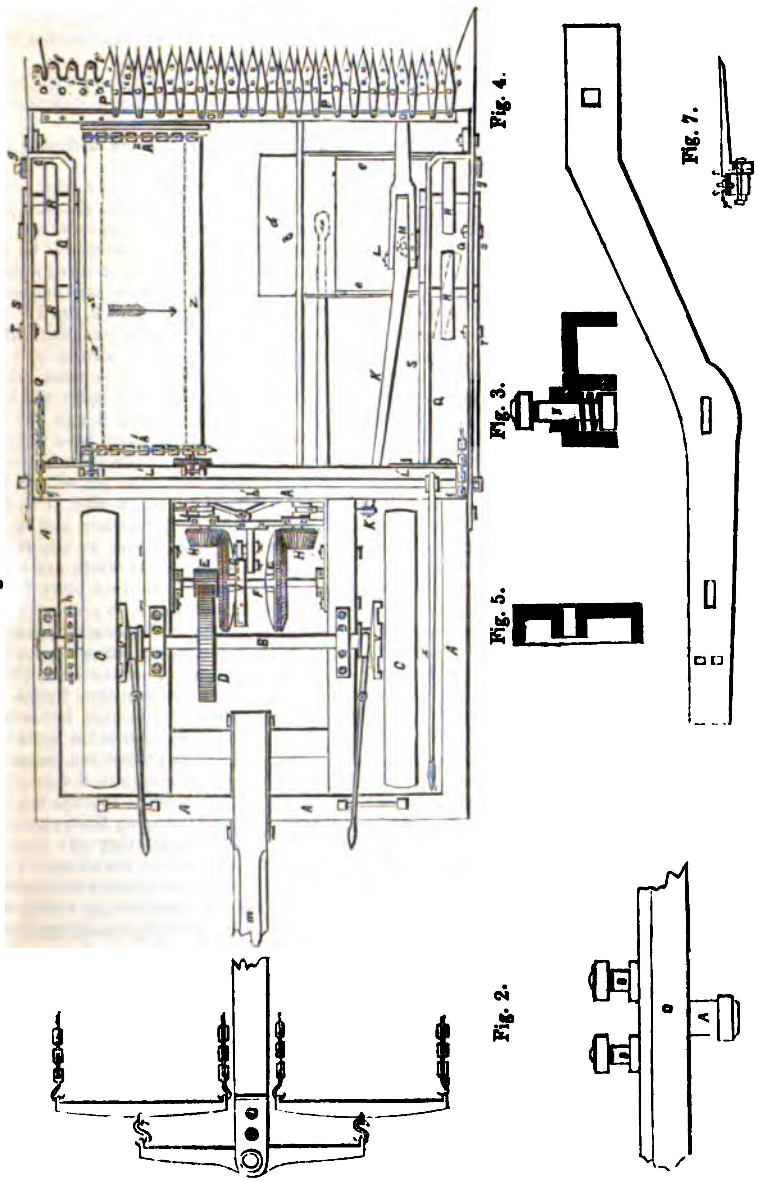

RIDLEY'S PATENT CUTTING AND REAPING MACHINE.

Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 7.

RIDLEY'S PATENT CUTTING AND REAPING MACHINE.

(Patent dated February 9, 1852. Patentee, Mr. Ralph Errington Ridley, of Hexham, Northumberland, tanner. Specification enrolled, August 9, 1852.)

Specification.

My invention consists, *first*, of a cutting-machine suitable for cutting corn, grass, and other standing crops by means of two sets of cutters or blades, one set being stationary, while the other set is moveable, so arranged and worked as to partake of a motion similar to that of the blades of shears or scissors; and

Second. Of a reaping-machine of an improved construction, to be worked in conjunction with my improved cutting-machine, or with a cutting-machine of a different construction.

And the manner in which I construct my improved machine is as follows:

Fig. 1 is a plan of a machine for both cutting and reaping constructed according to my invention. Figs. 2, 3, 4, 5, 6, and 7 are views of separate parts detached.

A, A, A, A, fig. 1, is a wooden frame; B the main axle, upon which the frame hangs; C C are the driving-wheels; D is a spur-wheel fixed upon the driving-shaft; and E a pinion worked by the spur-wheel D. It is only partially seen, being under the spur-wheel. The pinion E is keyed upon the shaft F, to which are also keyed two bevel-wheels G G, which gear into the bevel-pinions H H. These bevel-pinions are fixed to short cranked axles I I, which give motion to the connecting-rods J J. The other extremities of the connecting-rods have straps or eyes which fit on to the end of the lever K, as shown at *k*, fig. 1. There is another lever on the other side of the machine, which, being perfectly identical with the lever K, is not shown in the engraving. The lever K is in two pieces, united by a horizontal bolt at L, which admits of its lower end having a perpendicular motion, while it secures it from any looseness in its lateral motion. The pivot M is fixed upon the longer portion of the lever, and moves in a boss fitted for it in the projecting flange N. This flange is cast upon the sides of the machine, and is of sufficient strength to bear the resistance of the lever. The lower end of the short lever is forked to fit a pin upon the underside of the oscillating bar O O, which extends across the machine. The pin of this bar is seen at A, fig. 2. There are screwed into the bar O O several bolts, as seen at B, fig. 2. The tops of these bolts consist of short pieces turned true, with square collars and set nuts. The bolts screw into the oscillating bar, and the nuts are used to fix them at any required height. The bar O has a lateral motion, and rests upon friction-rollers which are beneath it, as shown in fig. 7. These rollers revolve on axes screwed on to the front plate P of the machine. The inner ends of the axes carry upright pieces *r r*, fig. 7, to prevent the bar from moving out of the straight line; slight projections *s s* on the front plate secure the bar on the other side. P P represents this front plate, part of it having the knives upon it and part clear, that its formation may be the more clearly represented. It is provided with two arms, one at each end, which bolt to projections in the end of the cast-iron frame, to be hereafter described. These arms are rounded on the top side at their ends, but are left square on the under side. The plate P rests upon these square ends against the ends of the frames, and can be moved upwards when required. The plate has projections, upon each of which are fixed steel knives, cutters, or blades *a a*, of the shape shown in the fig. 1. It is best to fix these knives (which form the stationary cutters) with small screws, the hands of which are countersunk so as to be flush with their tops; and in fixing them, great care should be taken to have them perfectly flush throughout, for should they not be so, the moving cutters (to be next described) will cut on one side, but not on the other. On the plate P, and between the projecting pieces *t t* are circular holes for the pivots *v* of the moving knives or cutters to pass through; these holes open into a square chamber or recess *u*, fig. 3. These square recesses receive the square head of a bolt or pivot *v* and a small spiral spring which rests upon the heads of the bolts and the upper side of the recess or chamber. The heads of the bolts are thus secured, to prevent the motion of the knives from turning the bolt, and thus prevent the knives from cutting. The bolt passes through the round hole (which it ought to fit exactly) to the top of the front plate P, then through the moving knife, and is made tight by a washer and nut. The moving knives are shaped in their cutting part exactly like a scissor-blade, slightly curved to the point towards the stationary blades. If, therefore, they were held firmly and rigidly by the bolt, they would not move. If, on the contrary, they were loose at the pivot to allow the curved part to rise, then they would cut at the points only. The springs are made sufficiently strong to secure a pressure upon the knives that will make them cut straw or grass, while they yield to allow the curved knife to rise, by which means the edges of the two knives are kept in constant contact, and consequently cut throughout their whole length. The spring yields in this machine exactly

as the hand does when using a pair of scissors. I have described and represented a spring applied at the pivot of the moveable blade, but, with slight modifications, it might be fitted to the fixed blade, and might also be fixed at the base of either the stationary or moveable cutters.

Fig. 6.

The moving knives are triangular in the cutting parts, and at their base they have an oblong slot of sufficient breadth to fit the pin on the bolt B (fig. 2), but longer, to allow for the curve described by the knives during their lateral motion. QQ, QQ, are two cast-iron frames united at back by the bar L'L' of the frame A, and at front by the plates PP, the space between the sides of each frame is about 6 inches. These frames are of the shape shown in fig. 4, having a rise of 12 inches. R, R, R, R, are four small wheels, by which these frames QQ, QQ, and their dependencies are carried. The centres of the wheels are about 18 inches distant from each other, so that when the machine is crossing a furrow, the first wheels are moved over it without touching the earth, until they reach the edge on the opposite side, and then they bear the front of the machine, and the others are carried over the furrow. By these means the front of the machine does not move up and down when passing over a furrow, but moves as evenly as when on level ground. S, S, S, S, are guide-rods on the inside and outside of each side of the cast-iron frames. These guide-rods are pierced with holes to receive the ends of the axles of the wheels R, R, R, R. The axles pass through a long aperture in the frames Q, and into the holes in the guide-rods. When the guide-rods on the outside of one frame, and the inside of the other frame, are moved in one direction, and the other two guide-rods in a contrary direction, the wheels R, R, R, R, are placed in an oblique position, as shown by the dotted lines, and the machine is forced round in whichever direction it is required. This motion of the guide-rods is obtained by a shaft passing under the part of the wooden frame A from end to end, from which it is suspended in strong bearings, and having four arms fixed on it, two in one direction, and two in the opposite direction. To these arms are bolted the guide-rods, so that when the shaft is moved, two guide-rods move in one direction, and two in the opposite direction. The shaft is moved by a long lever fixed to it, which passes backwards to the place where the manager of the machine is sitting on the back part of the frame A. To secure the steady motion of the guide-rods, slots are cut in them, and a bolt passes through, screwing into the sides of the iron frames, as at T, with a set nut on the other side of the frame.

The rods slide upon these bolts, and are secured from bending outwards by the heads of the bolts. U U, are clutches which slide upon the axle B. They are prevented from moving round, except when the axle moves by a groove cut in them, which fits a key fixed in the axle B. When the machine is required to travel without moving the cutters, these clutches are shifted back from the large wheel, and when the cutters are to be set in motion, the clutches are moved towards the wheels, and fit into counterparts fixed on the wheels. When the machine is cutting, and it is necessary to turn it, the inside large wheel should be thrown out of gear, otherwise it will not turn readily.

On the end of the cranked axle I, which projects from beneath the front of the wooden frame A, but which cannot be seen in the drawing, is a small spur wheel which actuates the wheel Y. The wheel Y is keyed on to the roller Z, round which pass the pitch chains A^1 and A^2, which also pass round the roller Z^1, so that when Z is moved, Z^1 moves also. An endless belt is attached at each end to the endless chain, and revolves with it in the direction of the arrow, so that any corn or grass falling upon it will be carried towards the centre of the machine. There are similar rollers, wheels, endless chains, and endless belt on the other side of the machine, but they are not shown in the drawing, in order that the levers beneath them may be seen. The belt on the other side moves in an opposite direction to that which is shown, and of course moves towards the centre.

V is a cam fixed on the axle F, shown in section in fig. 5. The friction pulley *c* presses against the outside of the rim of the cam, and a similar roller against the inside, so that when the cam revolves, a to-and-fro motion is imparted to the bar W. This bar actuates the levers XX, and these levers working on a pivot on the under side of the front of the wooden frame A, give motion to a board *d*, which slides upon two pieces of angle iron *e e*. These pieces of angle iron are fixed at one of their ends to the iron frame Q, and at the other to a bar of iron *f*, fixed to the frame A, and the front plate P. *gg*, shown separately on an enlarged scale in fig. 6, are cross sections of iron supports, which are bolted to the side of the frames. These iron supports are bent forward until they come above the points of the fixed knives, and then they rise twelve or fifteen inches. Upon each of these supports are adjustable bearings, *w*, which are fixed at any required height by a set screw. The axle of a gathering wheel stretches from one bearing to the other; it is five to six feet in diameter, and is made with six or eight slight arms. The extremities of the arms are connected by pieces of thin deal, fixed on with their edges parallel to the axle of the wheel. At one end of the axle of the gathering-wheel is a small pulley with projections upon it, suitable for a pitch chain, and on the axle B, on the same side of the machine, is another pulley *h*, with similar projections, so that on a pitch chain being passed over the two pulleys when the cutters are set in motion, the gathering wheel moves also. In order to raise the front, or cutting part of the machine, a chain is fixed to each side of the plate P P, which passes over a pulley, fixed about 6 inches up the iron supports *g g*, of the gathering wheel, and backwards to two pulleys *g g*, placed on a shaft h^1, upon the front of the frame A. The chains are fixed to the pulleys *g g*, and a lever *z* is attached to the axle h^1, which extends backwards to the reach of the manager, so that by moving the lever the axle and pulleys move, and the chain pulls up the front. The bearings of the lower end of the rollers Z and Z^1, being in levers fixed in the front would prevent the front from rising, unless some provision were made for them. To meet this the axles at the back ends of the rollers are prolonged, to allow them to slide through their bearings *i i*, which move upon their pivots to allow of the change in the position of the axles, *m* represents a strong pole, fastened at one end to the frame A. It is about 12 feet long, and carries at its other end a set of ordinary swingle or whipple trees, to which the horses are yoked, with their heads towards the machine.

The machine operates thus: When moved forward by the horses, the clutches, V V, are put into gear, which causes the shaft B to revolve, and along with it the spur-wheel D. This wheel moves the pinion E, upon the shaft F, by which the bevel wheels G G, are moved, and they give motion to the small bevel wheels H H, which being fixed to the axles I I, give motion to them, and to the cranks and the connecting rods J J. These connecting rods give to the levers K, a lateral oscillating motion, each revolution of the crank producing a motion right and left, which is communicated to the sliding-bar O, and by means of the bolts projecting from it to the moveable knives. Each revolution of the crank makes the moveable knives cut against both edges of the fixed knives. The speed at which the knives move, and their length, should always be proportioned to the size of the driving wheels. For example, I make the driving wheels 4 feet in diameter, and proportion the wheels, so that the bevel pinions, H H, shall revolve eighteen times during the time the driving wheels move once. This will enable the moveable knives to cut eighteen times against each edge of the fixed knives, or in all, thirty-six cuts. Now each knife cuts 4½ inches, so that

four and a half times thirty-six gives 162 inches, while the circumference of the wheel is only 150; there is therefore a sufficient allowance for any surging of the wheels. The gathering wheel is about 6 feet in diameter, and is driving by a pulley about 10 inches in diameter, fixed on the main shaft B, the pitch chain works over a pulley of similar size, upon the axle of the driving wheel, so that the periphery of the gathering wheel must move one-third faster than the periphery of the driving wheel; this has the effect of bending the corn towards the machine just at the time it is cut, and secures its falling back upon the endless belts, upon the rollers Z, and Z^1, and on the rollers on the other side of the machine. For grass and short corn the gathering wheel ought to have eight arms, but for long corn six arms are sufficient. The corn or grass being cut and laid upon the endless belt, is carried by it into the centre of the machine, when it may be allowed to fall on the ground, which it will do very regularly, the heads all in one direction, or it may be allowed to fall upon the board *d*, and upon its counter part (which is not shown). When these boards are moved under the belts, the corn falls to the ground in a bundle, and then the boards close again to receive a fresh accumulation. The cam V makes six revolutions for each revolution of the driving wheels; consequently the board *d* will move under the belt six times during each revolution of the driving wheels. Each revolution moves the machine over about 12½ feet, so that each delivery of the boards will lay down in a bundle, the corn standing on a space 2 feet by 6 feet. The endless belt should always be made to travel at the same speed as the machine. To accomplish this, I make the rollers 2⅝ inches in diameter, in order that eighteen revolutions may carry over, at least 150 feet of the endless belt, during each revolution of the driving wheels.

And having now described the nature of my said invention, and in what manner the same is to be performed, I declare that I claim—

First.—The machinery for cutting and reaping, before described, in the general arrangement, combination, and adaptation of parts of which the same consists.

Second.—The peculiar formation of the front plate, P P, with its projecting pieces and hollow square recesses for the reception of the spring and square head of the bolt on to which the knives are to be fixed, as before described.

Third.—The use of springs applied to the knives or blades of corn and grass-cutting machines, whereby the edges of the blades are caused to cut throughout their entire length.

Fourth.—The arrangements described for communicating an oscillating motion to the cutter-bar, O O.

Fifth.—The arrangements for raising the knives or blades of cutting machines before described.

Sixth.—The means before described, whereby cutting and reaping machines are caused to pass over hollows and furrows without descending into them.

And *Last.*—The arrangements whereby corn or grass, after being cut, is laid in continuous lines, or in bundles within the framework of the machine, as before described.

EXPERIMENTS ON THE RESISTANCE OF FLUIDS, NECESSARY TO IMPROVEMENT IN NAVAL ARCHITECTURE.

Government build ships of the line and frigates, private persons construct yachts, by way of experimenting on the *resistance of fluids*, but no attempts are made to ascertain the elements of that resistance. It was with a view to investigation of these elements that Sir Samuel Bentham devised the experiments on the subject, that were authorized by the naval authorities in the year 1830, for investigating the fittest form of hull for navigable vessels.

In these experiments he purposed ending where others begin, for instead of commencing with a ship of the line, for example, he would first have experimented on small models, would have proceeded on from them to boats, and then to small craft, awaiting the indications they respectively afforded before the expense should be incurred of constructing large vessels. An outline of the intended experiments, so far as could be collected from his papers, was given *ante* Nos. 1476, 1477; but as there exist but scanty notice in them of details, a gentleman has been applied to for further information, who had taken part in Sir Samuel's descriptions on the subject. He has replied as follows:

"I much regret that I am not able to state anything of importance in regard to those experiments, as all I remember on the subject consists in recollecting the laying out a most extensive plan of operations, with a view to the rising

from the then zero condition of our knowledge on the subject, step by step, to a full, clear, and accurate acquaintance with the laws of the resistance of fluids. I need not tell you how vast and perfect was the skeleton of our plan of operations, since it was designed and framed by Sir Samuel! I well remember his lively and earnest 'confession,' that he was 'now' able to 'start fair' with such an investigation. *Because* he had, after years of thought and experience, only just *then* arrived at the knowledge that we knew nothing about the subject. I have him this moment before the eye of memory, animated by his inspiring zeal in search of truth, announcing 'the great fact' of his having arrived at 'zero,' and so able to start fair on the great voyage of discovery of the properest form of hull to meet certain given conditions. Mr. Maudslay sitting, snuff-box in hand, and drinking in the inspirations of the great law-giver, with his countenance beaming with that peculiar delight with which he listened to the earnest propoundings of his dear old friend, with visions of nice models and cunning contrivances flitting before his mind's eye! Many a time do I recall such pleasant scenes before me, but I fear I have none else to narrate, as ere the apparatus was complete by which the campaign was to be opened, these great masters were called away into a more glorious existence, and all that had been done in the way of preparation was set aside, the animating spirits being gone, and I draughted into occupations of a more ordinary nature. It would, indeed, have been a vast pleasure to me had I been able to have furnished you with a more satisfactory account of these, I may say, *prepared* experiments; but as all that I had done in connection with them was only in respect to contriving, and executing, portions of the apparatus by which it was hoped we should get at some of the elementary laws and conditions of resistance of fluids, I have little else remaining in my recollection, than the remembrance of some of the means devised for the attainment of the objects in question, and even of them, a somewhat misty remembrance. The subject was one of vast compass, inasmuch, as by the changing of one element in the number of complex conditions, all assumed a new form and relation, and the only result certain, was one likely to upset all our anticipations. I presume it was the frequent occurrence of such unlooked for results by the change on introducing one new element, that caused Sir Samuel to rejoice so far that he had only arrived at the conclusion, that 'we know nothing about the subject;' this he called 'arriving at zero,' and 'starting fair.'—I fear we are not much above zero yet."

Hence there seems but little hope that details of the experiments devised in 1830, could now be recovered. But that scientific investigation was not lost to us with Sir Samuel Bentham and Henry Maudslay, ample proof is afforded by the splendid and rapid progress that since their time has taken place in so many departments of art and science. It seems only a misdirection of talent that has hitherto prevented inquiry into the fundamental principles in question, and that has thus impeded the advance that might have been hoped for in the elementary base on which the science of naval construction should be raised.

The practical inference to be drawn from the above-mentioned premises is, that naval architects, instead of building experimental vessels, should apply themselves to investigation of the laws which influence the progressive motion of bodies through fluids. Experiments to this end would necessarily be numerous; for in regard to sea-going vessels, besides the resistance of the fluid in ordinary circumstances, of its being more or less agitated, and that to a lesser or greater depth, and besides the form of the body itself, there would be to be examined the degree of influence that greater or less immersion of it would have upon its motion through the water; and further, the differences that would be occasioned by varieties in the means of propulsion, such as whether the apparatus acts wholly under water, as a screw might do; or whether the propeller should be partially and occasionally immersed, as the oar, the sweep, the paddle-wheel; or whether the motive apparatus be wholly above water, and not acting on it, or by means of it, as sails. In addition to these various subjects of inquiry there would be to be ascertained the influence of winds in retarding or varying progressive motion

according to the direction and force with which they impinge upon such parts of the body as are above water. Truly, the "subject is one of vast compass."

It may be asked why, with such sentiments, did Sir Samuel, in the year 1795, build half-a-dozen vessels of war as experimental ones? The answer would be sufficient that he had not, at that time, arrived at the knowledge that we know nothing on the subject; but, in point of fact, those experimental vessels were not designed to show the fittest form of hull, but to exhibit that mechanical principles are as applicable to navigable vessels as to any structure on land, although those principles had been till that time entirely neglected in naval architecture. Thus he in those vessels, for the first time, introduced some of the commonest means employed by civil architects and machinists for giving strength with the smallest expenditure of materials;—he in those vessels was the first to introduce diagonal trusses and braces,—where ties were employed, the making them straight instead of curved; he also used that well-known efficient fastening, the screw, &c., &c. His vessels accordingly, after many years of severe war-service, were found to exhibit unprecedented strength, and have been the models according to which many of the greatest improvements in point of strength have since become of very general use. But although the introduction of mechanical principles in ship-building was the chief aim of those vessels, his previous observations in actual naval service, together with his scientific attainments, had enabled him greatly to improve upon the then usual form of hull, especially by increase of its length in proportion to its breadth, which has since been amongst the most prominent causes of the present rapid speed of vessels.

However much he appreciated the advantages of "starting fair," and making fundamental experiments, he was also desirous of reaping the benefit that might be obtained from judicious experience of the capabilities of existing vessels. He saw little good in such trials of the speed of a vessel as may be obtained on a measured mile, by short races of yachts one with another, or by very costly channel fleets, and their sailing-matches for experiment; it was, on the contrary, in *long* voyages on *actual service* that he hoped to obtain proof of the qualities, good or bad, of existing vessels; and this by a saving, instead of great expense to the public, as he proposed to His Royal Highness the Lord High Admiral, 7th March, 1828.* The main purport of that communication was to exhibit the extravagance of hiring merchant vessels as transports, especially when so many Government vessels are lying unused, to rot in harbour; but he further exhibited many collateral advantages that would result from the measure he proposed. One of these advantages was relevant to the present subject, and was thus stated:

"1st. Considering that the desiderata in ships, to render them the most fit for transport service, are nearly similar to those requisite in vessels intended for general warfare, if ships built for the use of his Majesty's service are generally more efficient than those built for the service of private individuals, better ships would be obtained for the transport service. If, on the contrary, any of the Government-built ships should be found inferior, such inferiority being brought to notice, could not fail to tend to improvement, as there can be no doubt but Government might build ships as good in all respects as any private individuals."

And the fourth collateral advantage was thus stated:—"The affording an opportunity in time of peace for experimental observations on the sailing and other properties of vessels, without sending out vessels to sea for that purpose only."

The eight other specified collateral advantages, though all of them important, are not immediately relevant to the qualities of navigable vessels themselves.

Objections likely to be made to the employment of vessels of war as transports were foreseen by Sir Samuel and repudiated; amongst others, "That vessels built expressly for the conveyance of merchandise might be supposed more fit for the purpose, as being more bulky than a ship built for war; but, in answer to this objection, it must be observed that a vessel of war, when stored for

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* Afterwards published in the *United Service Journal*, 1836, part I., page 41.

foreign service, actually carries a weight of guns, ammunition, stores, men, and ballast, equal in amount to what a merchantman can well convey; that a vessel of war may by her lading be brought as deep in the water as a merchantman; that capacity is equally desirable in both cases, and that the over-loading a vessel, so as to make her a bad sailer, and thereby produce retardation,—a delay in both cases, might equally cause a loss of interest on capital, such as to over-balance any saving produced by the increased quantity put on board; independently of all other disadvantages resulting from the employment of bad sailing vessels. The superior accommodation usually afforded in vessels of war for the great number of men employed in working the guns, &c., are equally essential for the due conveyance of troops, more especially as landsmen can less bear inferiority of such accommodations than seamen, accustomed as they are to nautical inclemencies and inconveniences."

Since the above proposal was made, Government ships have been more employed than formerly in the conveyance of troops; and many are the instances brought to notice in the daily papers of the inferiority of those vessels in point of speed, yet no investigation is ever attempted of the *cause* of such inferiority. For example, much has been said of the *Megæra's* late passage home from the Cape, she having been 61 days in coming from thence to Plymouth, of which 49 days were actually at sea, whereas the General Screw Steam Shipping Company's packet, the *Hellespont*, made the same voyage in 35 days only from port to port, she having started after the *Megæra*, and arrived before her. Remarkable as is this great difference in speed, no inquiry has been instituted as to its *cause;* no comparison has been made as to difference in the form of these vessels, nor of their rig, or of their propelling apparatus. It is possible, though not probable, that difference of skill in the respective commanders might have occasioned the great disparity. It seems that the steam apparatus of the *Megæra* must have been defective, since the use of it had repeatedly set the vessel on fire on her voyage out; her bottom was found at Sheerness to be very foul, but this could hardly have occasioned a difference of so many days. Where disparity is so immense, a comparison of every influencing particular could not fail to be instructive, and would tend infinitely more to the advancement of naval architecture than any racing-match, or any few hours' trial of speed between Government vessels in a race in the Channel. It has appeared, however, that the superiority of one yacht over the others in the late race, depended much less on the form of hull than on difference in rig, one variety of it having enabled advantage to be taken of different changes of wind, tide, and local currents, since it may be supposed that the respective commanders of the competing vessels were equally competent to manage their yachts under all circumstances. But it is of no avail in the art of ship-building that such races should be instituted, or such discrepancies be brought to notice, so long as *effect* is alone stated without the slightest reference to *cause.*

These, and many other examples that might be adduced, do but confirm Sir Samuel's opinion in regard to naval architecture, that we are *in complete ignorance of fundamental principles;* and that to "start fair" in experiment, we must commence at "zero."

M. S. B.

SAFETY-LAMPS ON BOARD SHIP.

In the *Times* of the 13th inst. is the letter of a passenger on board the Royal Mail Company's ship *Severn*, giving particulars of the narrow escape that vessel had had of being consumed by fire, as was the *Amazon*. That correspondent having been repeatedly awakened by the crying of her child, smelt fire on the last occasion, opened a small window that looked down upon the saloon, and saw that it was filled with smoke. She gave an immediate alarm, and, by the great exertions of the officers and passengers so roused, the fire was extinguished, but not without, unfortunately, materially wounding the captain.

It appeared that the fire had originated in the place where wine and spirits were kept; the cause of the ignition there of a quantity of straw, &c., was not known, but it was supposed to have taken place from the carelessness of some one who must have gone to regale himself with wine or spirits. The passenger had the day before seen a man

"dealing out tar with a lighted candle in his hand," and says that the day after the fire another man "was confined for being found below with a lighted candle." The same passenger urges the need of establishing an efficient police on board of vessels employed as packets; this is very true, but the great danger of allowing open candles to be used is also evident.

It is now fifty-six years since Sir Samuel Bentham invented safety-lamps for ship use, no less than fifty-four years since the fact was recorded by the Committee on Finance of 1798, after approval of his evidence by the Board of Admiralty, yet such lamps remain yet desiderata both in the Royal Navy and in merchant vessels. This invention is now brought to notice in the hope that, by its adoption, some such sad catastrophe may be averted as that which befell the *Amazon*.

The Naval Work, No. 2, laid before the Committee on Finance, in obedience to their order, relates to Sir Samuel's experimental vessels, the 6th article of which briefly describes his expedients for avoiding danger of conflagration; it is as follows:

"6th.—To lessen the danger of explosion, and what is perhaps of equal importance—the apprehension of it in case of fire—the powder is kept in water-tight cases of tinned copper, in such manner as that the whole may be laid under water in time of danger, and rise dry again afterwards: by the same means it is also preserved from being injured by moist air. There is always a stratum of water interposed between the powder-room and the lamp which lights it."

Similar means of laying the magazine of the *Orinoco* under water have been adopted in that vessel, and this arrangement is considered as one of the greatest improvements exemplified in that vessel. It is to be regretted that the lamp Sir Samuel devised for the *Arrow* has never been particularly described, but it is thus indicated in his "Statement of Services," addressed to the Admiralty in 1813:

"*Magazine Lights.*—25thly. The having devised and introduced, instead of a room appropriated to the purpose of giving light to the magazine, and instead of candles, lamps encompassed by a double partition of glass, filled between with water."

To this is now added, from recollection, that in case of fracture of the glass, the whole was so disposed that the water would fall upon the light and extinguish it; that the syphon-shaped pipes for the introduction of fresh air, and for the emission of foul, were so contrived that no danger could arise from sparks.

Lamps of this description might be unhandy for general use on shipboard; but the water necessary is not of too great weight to preclude the use of portable lamps of the kind for many occasional purposes. It would seem advisable that no other light should be used for going below to such places as the wine-store of the Severn; as also for affording sufficient illumination to sleeping cabins, &c., during the night, the self-acting extinguishing power of them being so very desirable.

The use of *candles* was uniformly deprecated by Sir Samuel both in manufactories and on board ship, lamps being so much safer. He determined before the year 1805 that no candles should be allowed in the wood-mills at Portsmouth, and substituted a kind of lamp thus spoken of in his statement of services:

"*Lamps.*—The having, with a view to the diminution of danger from fire, as well as with a view to economy, introduced the use of lamps instead of candles. . . .

"The lamps used in this establishment" (the wood-mills) "being inclosed in glass in such manner as to obstruct scarcely any of the light, are so contrived as to do away the danger of fire from sparks falling from the lamps, and to prevent inflammable substances from coming in contact with the flame. By these same means, working-places in general may be lighted free from that danger which cannot but have place where candles are employed." He stated his belief that these lamps were of the invention of Mr. Grimshaw.

Lamps of this kind are applicable to all the purposes for which artificial light is used on board ship. It is needless to say that they are susceptible of great variety in form and ornament.

The arrangement of reflectors latterly introduced with so great effect into light-houses is supposed to have suggested to Mr. Hesketh the application of reflectors to the better lighting the interior of buildings by day.—(See *post* p. 158.) On

the same principle various parts of a vessel might be much better illuminated than at present; and by a judicious arrangement of reflectors, light might be thrown from fixed lamps on board ship, so as to do away altogether with moveable ones, and thus greatly diminish danger of conflagration.

PATENT LAW OF THE UNITED STATES AS APPLIED TO ENGLISHMEN.

In the next Number of your Magazine will you draw the attention of the proper authorities to the necessity of getting the tax reduced upon patents taken out by Englishmen in the United States, which is now eighteen times more than that paid by an American citizen, and considerably more than is paid by subjects of any other country.

The plea for this mulcting of Old John by his own offspring has always been that of the right of retaliation for the high price the old gentleman sets upon his own patents; but he being now about to grant them at a far more reasonable rate than he has hitherto done, it is to be hoped his son will follow his example. In fact, if the plea hitherto put forth be the real ground of the distinction, it is cut from under him, and unless he at once places patents granted to Englishmen on the same scale as those granted to all other foreigners, the world will be constrained to look upon the matter as another instance of the "cute" young gent.'s settled determination to annex the old boy's sovereigns to his dollars whenever an opportunity offers.

JUSTICE.

OFFICIAL REPORT ON THE PROBABLE CAUSES OF THE BURNING OF THE "AMAZON." BY PROFESSOR GRAHAM.

February 17th, 1852.

MY LORDS,—In reply to the questions arising out of the disastrous loss of the *Amazon* by fire, which are proposed to me for a chemical opinion, I beg to submit to your Lordships the following statements and conclusions:

The practice of mixing together the various stores of the engineer, consisting of oils, tallow, soft-soap, turpentine, cotton waste and tow, and placing them in heated store-rooms contiguous to the boilers, must be looked upon as dangerous in no ordinary degree, for several reasons. Although oil in bulk is not easily ignited, particularly when preserved in iron tanks, still when spilt upon wood or imbibed by tow and cotton waste, which expose much surface to air, the oil often oxidates and heats spontaneously, and is allowed to be one of the most frequent causes of accidental fires. The vegetable and drying oils used by painters are most liable to spontaneous ignition, but no kind of animal or vegetable oil or grease appears to be exempted from it; and instances could be given of olive-oil igniting upon sawdust; of greasy rags from butter, heaped together, taking fire within a period of twenty-four hours; of the spontaneous combustion of tape-measures, which are covered with an oil-varnish, when heaped together; and even of an oil-skin umbrella put aside in a damp state. The ignition of such materials has been often observed to be greatly favoured by a slight warmth, such as the heat of the sun. I am also informed by Mr. Braidwood, that the great proportion of fires at railway stations have originated in the lamp-store, and that in coach-works also, when the fire can be traced, it is most frequently to the painters' department, the fire having arisen spontaneously from the ignition of oily matters. Lamp-black and ground charcoal are still more inflammable, when the smallest quantity of oil obtains access to them, and should not be admitted at all among ships' stores.

The stowing metallic cans or stoneware jars of either oil or turpentine in a warm place is also attended with a danger which is less obvious, namely, the starting of the corks of the vessels, or the bursting of them by the great expansion of the liquid oil which is caused by heat. These liquids expand in volume so much as one upon thirty by a rise of not more than 60° of temperature, or by such a change as from the ordinary low temperature of 40° to a blood heat; the latter temperature may easily be exceeded in an engine-room. It is remarkable that the burning, a few years ago, of a large steamer on the American lakes, which even surpassed in its fatality the loss of the *Amazon*, was occasioned by the bursting, in the manner described, of a jar of turpentine placed upon deck too close to the funnel, by a party of journeymen painters who were passengers. This steamer was also on her first voyage, and being newly varnished, the flames spread over her bulwarks, and extended the whole length of the vessel in a few minutes.

The bulkheads of coal holds appear to admit of obtaining considerable security from fire by being constructed double where close to the boiler, with a sheet of air between the two partitions. The tendency of

coals to spontaneous ignition is increased by a moderate heat, such as that of the engine-room, from which they would be protected by the double partition. I have obtained instances where coals took fire in a factory, on two different occasions, by being heaped for a length of time against a heated wall, of which the temperature could be supported by the hand; also of coals igniting after some days upon stone flags covering a flue, of which the temperature was not known to rise above 150°, and of coals showing indications of taking fire by being thrown in bulk over a steam pipe. These were Lancashire coals, which are highly sulphureous; but the same accident occurred with Wallsend coals, at the Chartered East Company's works in London, where the coals were twice ignited through a two-feet brick wall, of which the temperature was believed by Mr. Croll not to exceed 120° or 140°.

The surface of deal in the partition opposed to the boiler would probably be better protected from fire by impregnating the wood with a saline solution, which diminishes combustibility, such as the zinc solution of Sir W. Burnett, rather than by coating the wood on the side next the boiler with sheet iron. Indeed, this use of iron appears to introduce a new danger. The iron being a good conductor of heat, the wood below is heated nearly as much as if uncovered, and wood in contact with iron appears to be brought by repeated heating to an extraordinary degree of combustibility, and to become peculiarly liable to spontaneous ignition.

Mr. Braidwood, who has been led to that conclusion, gave an instance of wood covered by sheet iron igniting spontaneously in a wadding manufactory. The numerous occasions, also, on which wood and paper have been ignited by Perkins' heated water pipes, equally exemplify the dangerous consequences which may arise from moderately heated iron in long contact with combustible matter.

The most obvious precautions for guarding against the spontaneous ignition of coal stowed in ships' bunkers appear to be the taking the coal on board in as dry a condition as possible, and the turning it over, if there is room for doing so, as soon as the first symptom of heating is perceived. An obnoxious vapour is described as always preceding the breaking out of the fire, and affords warning of the danger. The ignition of Newcastle coals in store is not an unfrequent occurrence at the London gas-works. It appears always to begin at a single spot, and is met by cutting down upon and removing at once the heated coals. Long iron rods are placed upright in the coal heap, which can be pulled out, and indicate by their warmth the exact situation of the fire. Steam can be of little avail for extinguishing fire among coals in bulk; and water, although it may extinguish the fire for the time, is too apt to induce a recurrence of the evil.

For extinguishing a fire occurring in berths or cabins in the immediate vicinity of the boiler and engine-room, steam might be more advantageously applied, means of turning on the steam being provided upon the upper deck, or other distant place of safety. Steam, however, can only be said to be efficient in extinguishing flame, or a blaze from light objects, and is not to be relied upon beyond an early stage of a fire. Upon a mass of red-hot cinders the extinguishing effect of steam is insensible.

An essential condition of applying steam with success to the extinction of a fire in the engine-room, would be to prevent the rapid ingress and circulation of the air at the same time, which is occasioned by the draught of the fires. This could only be done completely by valving the chimneys; for the quantity of heated air passing off by the funnel greatly exceeds in volume the steam produced by the boilers in the same time, and would rapidly convey away the steam thrown into the atmosphere of the engine-room, and prevent any possible advantage from it.

The fire in the *Amazon* appeared to the witnesses to take its rise either in the small oil store-room situated over the boiler, or in a narrow space of from three to eleven inches in width between a bulkhead and the side of the boiler, immediately under the same store-room. No substance remarkable for spontaneous ignition, such as oiled cotton waste, was actually observed in the store-room, or the space referred to. The wood itself of the bulkhead, which was within a few inches of the boiler, may have been highly dried and sensibly heated by its proximity to the latter, but is not likely to have acquired any tendency to spontaneous ignition; for when that property results from low heating, it is an effect of time, requiring weeks or months to develop it. The same observation applies to the decks in contact with the steam-chest which incased the base of the funnel.

Nor does it appear probable that the coals in the coal-hold of the vessel gave occasion to the fire by heating of themselves, and then burning through the wooden partition of the oil-store with which they were in contact.

These coals were from Wales, and not remarkable for this property.

They are also said to have been shipped in a dry and dusty state, and not damp, a month or two previously.

Their ignition would also have been preceded by the strong odour before referred to, which does not appear to have been remarked, although the coal-hold communicated directly with the boiler-room.

Oil was seen to drop from the floor of the store-room upon the top of the boiler, but not in greater quantity than might be accidentally spilt in drawing the oil from the tank for the use of the engineers.

A parcel of twenty-five newly-tarred coal-sacks, which had been thrown upon the boiler, also obtained, it is supposed, some of the same oil. This oil appears to be the matter most liable to the possibility of spontaneous ignition, which was noticed near the spot where the fire commenced.

But the sudden and powerful burst of flame from the store-room, which occurred at the very outset of the conflagration, suggests strongly the intervention of a *volatile* combustible, such as turpentine, although the presence of a tin can of that substance in the store-room appears to be left uncertain. It was stated to be there by two witnesses, but its presence is denied by a third witness. I find upon trial, that the vapour given off by oil of turpentine is sufficiently dense, at a temperature somewhat below 110°, to make air explosive upon the approach of a light. Any escape of turpentine from the heated store-room would therefore endanger a spread of flame, by the vapour communicating with the lamps burning at the time in the boiler-room, or even with the fire of the furnaces.

The fire appears not to have begun in the tarred sacks laying upon the boiler, although from their position, which was close to the store-room, they must have been very early involved in the conflagration, and contributed materially to its intensity. The sacks appear to have been charged each with about two pounds of tar, thus furnishing together fifty pounds of that substance, in a condition the most favourable that can be imagined for rapid combustion. The freshness of the tar and its high temperature would make it ignite by the least spark of flame, although not prone to spontaneous ignition. The burning of a group of newly-tarred cottages in Deptford, which came under the notice of Mr. Braidwood, arose from their being set on fire by lightning, while the sun was shining upon them, and the tar liquefied by the heat.

The origin of the fire must remain, I believe, a subject of speculation and conjecture; but the extreme intensity and fearfully rapid spread of the combustion are circumstances of scarcely inferior interest, which are not involved in the same obscurity.

The timber of the bulkheads and decks near the engine-room is reported to have been of Dantzic red wood or Riga pine, and such was the character of a portion of the *Amazon's* timber which was supplied to me for chemical examination. The wood has had its turpentine drawn off, and differs in that respect from pitch pine. The Dantzic red wood, is, in consequence, less combustible than pitch pine, but more porous and spungy. Oil-paint is absorbed, and dries more quickly upon this porous wood than upon oak and other dense woods. After their paint is well dried, pine and other woods certainly acquire from it some protection from the action of feeble and transient flames, which might kindle the naked wood. But the effect of paint, especially of fresh paint, appears to be quite the reverse, when the wood is exposed to a strong although merely passing burst of flame. The paint melts and emits an oily vapour, which nourishes the flame and soon fixes it upon the wood. There can be no doubt, therefore, that the timber of the *Amazon* was in a more inflammable state than ship-timber usually is, from being recently painted, and also probably from its newness and comparative dryness.

But the circumstance which appears above all others to give a character to the fire in the *Amazon* was its occurrence, not in close hold or cabin, but in a compartment of the vessel where a vigorous circulation of air is maintained by the action of the boiler-fires and their chimneys. The air of the engine-room must be renewed under this influence every few minutes, and would be so although full of flames rising above deck through the hatchways; for a portion of these flames would always escape by the funnels, and add to their aspirating power instead of diminishing it. The combustion of bulkheads or decks once commenced in this situation would therefore be fanned into activity and powerfully supported.

The destruction of the oil store-room, and the overturning, in consequence, of the oil tanks and combustibles into the well of the boiler-room, was probably the crisis of the fire. A mass of combustible vapour would speedily be generated, and shot about on all sides, of which the kindling power upon the new and painted timber of the bulkheads and decks would be wholly irresistible.

The burning of the *Amazon* impresses most emphatically the dangerous and uncontrollable character of a fire arising in the engine or boiler-room, where the combustion is animated by a steady and powerful

circulation of air, and the danger of collecting combustible matter together in such a place. The removal of the oil stores to a safer locality is, fortunately, generally practicable, and is the measure best calculated to prevent the recurrence of any similar catastrophe.

I have the honour to remain, &c.,

THOMAS GRAHAM.

To the Lords of the Committee of Privy-council of Trade.

MR. TALBOT'S PHOTOGRAPHIC PATENT RIGHTS.

The following correspondence has taken place between the Presidents of the Royal Society and the Royal Academy and Mr. Talbot, the patentee of the art of photography upon paper.

London, July, 1852.

Dear Sir,—In addressing to you this letter, we believe that we speak the sentiments of many persons eminent for their love of science and art. The art of photography upon paper, of which you are the inventor, has arrived at such a degree of perfection that it must soon become of national importance; and we are anxious that as the art itself originated in England, it should also receive its further perfection and development in this country. At present, however, although England continues to take the lead in some branches of the art, yet in others the French are unquestionably making more rapid progress than we are. It is very desirable that we should not be left behind by the nations of the Continent in the improvement and development of a purely British invention; and, as you are the possessor of a patent right in this invention, which will continue for some years, and which may, perhaps, be renewed, we beg to call your attention to the subject, and to inquire whether it may not be possible for you, by making some alteration in the exercise of your patent rights, to obviate most of the difficulties which now appear to hinder the progress of art in England. Many of the finest applications of the invention will, probably, require the co-operation of men of science and skilful artists. But it is evident that the more freely they can use the resources of the art, the more probable it is that their efforts will be attended with eminent success. As we feel no doubt that some such judicious alteration would give great satisfaction, and be the means of rapidly improving this beautiful art, we beg to make this friendly communication to you, in the full confidence that you will receive it in the same spirit—the improvement of art and science being our common object.

ROSSE.

C. L. EASTLAKE.

To H. F. Talbot, Esq., F.R.S., &c., Lacock Abbey, Wilts.

Lacock Abbey, July 30.

My dear Lord Rosse,—I have the honour of receiving a letter from yourself and Sir C. Eastlake respecting my photographic invention, to which I have now the pleasure of replying. Ever since the Great Exhibition, I have felt that a new era has commenced for photography, as it has for so many other useful arts and inventions. Thousands of persons have now become acquainted with the art, and, from having seen such beautiful specimens of it produced both in England and France, have naturally felt a wish to practise it themselves. A variety of new applications of it have been imagined, and doubtless many more remain to be discovered. I am unable myself to pursue all these numerous branches of the invention in a manner that can even attempt to do justice to them, and, moreover, I believe it to be no longer necessary, for the art has now taken a firm root both in England and France, and may safely be left to take its natural development. I am as desirous as any one of the lovers of science and art, whose wishes you have kindly undertaken to represent, that our country should continue to take the lead in this newly-discovered branch of the fine arts; and, after much consideration, I think that the best thing I can do, and the most likely to stimulate to further improvements in photography, will be to invite the emulation and competition of our artists and amateurs by relaxing the patent right which I possess in this invention. I therefore beg to reply to your kind letter by offering the patent (with the exception of the single point hereafter mentioned) as a free present to the public, together with my other patents for improvements in the same art, one of which has been very recently granted to me, and has still thirteen years unexpired. The exception to which I refer, and which I am desirous of still keeping in the hands of my own licensees, is the application of the invention to taking photographic portraits for sale to the public. This is a branch of the art which must necessarily be in comparatively few hands, because it requires a house to be built or altered on purpose, having an apartment lighted by a skylight, &c., otherwise the portraits cannot be taken indoors, generally speaking, without great difficulty. With this exception, then, I pre-

sent my invention to the country, and trust that it may realise our hopes of its future utility. Believe me, &c.,

H. F. TALBOT.

The Earl of Rosse,
Connaught-place, London.

MR. BAIN'S ELECTRIC CLOCK-WORKS.

Among all the wonders of that wonder-working principle, electricity, whether we view its powers in the instantaneous conveyance of information between distant places, its agency in blasting rocks in safety, the deposition of metals from their solutions, or others of its numerous appliances, there is not one of them which strikes the mind as more extraordinary or interesting than its application as a prime mover for the measurement of time. In this, however, it has now become most completely successful, and insures a correctness and regularity which cannot be obtained by other clocks, however well constructed. We believe the first idea of working clocks by electricity is due to Mr. Alexander Bain, who first commenced putting it in practice in 1837. His first attempt was to make a common clock transmit its time to other clocks at a distance, effected by the action of electro-magnets, in which he was perfectly successful. The next step was the application of the electric power to work single clocks, so that no winding might be required, and the common clock be dispensed with altogether. This, in a commercial point of view, was of great importance, as such a clock, either for private houses or public buildings, could be used either singly or made the governor or parent clock to other dials in different parts of the building. The ordinary galvanic apparatus was found, however, neither uniform or lasting, giving more trouble and expense than the common clocks; and in prosecuting his experiments, Mr. Bain, in 1842, discovered that a plate of zinc and one of copper, buried in the earth, gave a uniform and continuous force of sufficient power to work clocks of any size, from the smallest mantel time-piece to large church clocks.

In the construction of an electric clock, the pendulum rod is of wood and suspended to a metal bracket, fixed to the back-board. The bob of the pendulum is composed of a reel of insulated copper wire, with a brass covering to improve its appearance, forming an electro-magnet in the usual manner. The ends of the wire are carried up the rod, terminating in two suspension springs, which serve the double purpose of suspending the pendulum, and conveying the current to and from the bob. Two brass tubes contain each a bar of magnetised steel, and act as alternate attractors to the bob. There is a break on the pendulum for letting on and cutting off the current, which acting on the bob, operates also on clocks at distant places. The plates of zinc and copper are buried about 4 feet underground, and 3 feet apart, and to them perfectly insulated copper wires are soldered. A regulating weight being attached to the pendulum to bring it to time, the apparatus is complete. For the motion on the dial-plate, only two wheels and an endless screw are required, besides the minute and hour wheels; and the clock instead of moving the pendulum, being, on the contrary, moved by it, a much smaller degree of stress and friction is the result. The pendulum once set in motion acts on the break; and the current being, as we have shown, alternately cut off and admitted, regular motion is obtained which will continue for many years.

In situations where it is inconvenient to obtain the electric current from the earth, the voltaic battery is resorted to; but in almost every case the first mode has proved the easiest, as well as the most effective. The cost of its plates is a trifle, and it has been ascertained that they retain the efficacy for years. The advantages of this application of electricity to another of our wants it is scarcely possible to estimate, as through the medium of auxiliary clocks, exact time may be kept through a whole neighbourhood, or, in short, to wherever wires can be laid down. In fact, it is now shown to be possible that all the principal clocks in the kingdom might be united to keep time with one governing one, which, again, derives its moving power from the earth, without winding up or need of attendance of any kind from one year's end to another.

SEWING BY MACHINERY.

From a recent statement in the *Scientific American*, it appears that Brother Jonathan has already made great progress in the adaptation of machinery to a branch of industry, which on this side of the Atlantic still remains in the absolute domain of the human fingers. After enumerating seven different patents which have been taken out for sewing, commencing with Johnson and Morey's in 1845, to Wilson's, the latest and best, our contemporary thus proceeds: "Any one of them, but the Wilson machine especially is, in our opinion, a great triumph of American genius. It is no larger than a neat small work-box, very portable and convenient, and we have seen fine shirt bosoms and collars stitched by it in a more perfect and accurate manner than any we have ever seen done by hand work. When

we first noticed Howe's Sewing-machinery, in 1847, there was not a solitary machine of the kind in active operation, in our whole country, if in the world. There are now, we believe, about five hundred in operation, and we have been told by Mr. Wilson that the orders for his machines cannot be supplied fast enough. There are at present a hundred machines about finished at the Company's works—Wheeler, Wilson, and Co., Watertown, Connecticut, and these are all engaged.

"When we look at the progress made in sewing-machines, we expect them to create a social revolution, for a good housewife will sew a fine shirt, doing all the seams in fine stitching, by one of Wilson's little machines, in a single hour. The time thus saved to wives, tailors, and seamstresses of every description, is of incalculable importance, for it will allow them to devote their attention to other things, during the time which used to be taken up with dull seam sewing. Young ladies will have more time to devote to ornamental work (it would be better for them all if they did more of it), and families in which there are a number of children, which require a continual stitching, stitching, in making and mending from morning till night, will yet be blessed by the improved sewing-machine."

THE GREAT INDUSTRIAL EXHIBITION TO BE HELD IN DUBLIN, 1853.

On the 1st of May, 1853, will be seen in Dublin what can be done in the way of an Industrial Exhibition. The Royal Dublin Society then holds its triennial exhibition of manufactures; but this usual exhibition will be merged into and, no doubt eclipsed by, the Exhibition of 1853. With a view of affording the Society the means of carrying out the design to its fullest extent—of making it what its most sanguine friends expect it to be—Mr. Dargan, the eminent Irish railway contractor, has promised to place at the disposal of the Exhibition Committee the handsome sum of 20,000*l*. Mr. Dargan does not do things by halves. He has, therefore, in the true spirit of liberality, accompanied his promise of 20,000*l*. with an intimation that, should that sum be insufficient to help the Committee through with their great undertaking, he will add to it—double it, if necessary.

The offer of prizes for designs for the building brought in numerous plans more or less elegible. The first prize was awarded to that of Mr. John Benson, C.E., of Cork, who, in conjunction with Sir Thomas Deane, was the architect for the building of the Cork Exhibition; the second prize to Messrs. Deane and Woodward, of Cork; and the third prize to Mr. Turner, of Hammersmith-works, Dublin.

The following descriptive particulars of Mr. Benson's design, which has been adopted for the Exhibition Building will be read with interest:—Presenting a front to Merrion-square of 300 feet, the main or centre feature of the elevation consists of a semicircular projection, which forms the eastern termination of the central hall. This will be a noble apartment of 425 feet in length, and 100 feet in height, covered by a semicircular roof upon trellis ribs, in one span of 100 feet. On each side of the centre hall, and running parallel to it for the same length, are two halls 50 feet wide, with domed roofs, similar to that which covers the main nave or hall of the building. The height from the floor to the roof of each of these halls will be 65 feet. They are approached through passages from the centre hall. In addition to these three halls are four compartments of 25 feet wide, running the whole length of the building; two are placed between the centre hall and the side halls, and two on each side of the latter; divided into sections of 25 feet square, forming convenient divisions for the purposes of classification. Over these compartments are spacious galleries, also running the length of the building, which will not only afford increased space for exhibition, but be an agreeable promenade, from whence the effect of the three halls will be seen to great advantage. The ceiling of the halls being divided into panels formed by the trellis ribs, and the other constructive parts of the building, will provide ample opportunity for effective decoration. Light is admitted from above in one unbroken and equally-distributed body. The construction of the building is strongly marked on the elevation, and forms in fact the ornamental character of the design. There are also external galleries which will be attractive features in the exterior, and will be useful in providing access to the roof for repairs, &c. The termination of each of the principal roofs to the east and west is semispherical, giving strength as well as effect to the building. There will be three entrances in the front facing Merrion-square, under a range of verandahs, through which access will be had for the holders of season tickets and the general public. The materials of the building will be iron, timber, and glass. The latter will only be used for light, as before described. The parts of the roof at each side of the lights will be timber, covered with the waterproof cloth manufactured by Messrs. Malcolmson, of Portlaw, County Waterford. The trellis girders which sup-

port the galleries will be of wrought-iron, supported on cast-iron pillars. Ample accommodation in the way of refreshment, retiring-rooms, offices, &c., is provided in the plan. Access to the building can also be had by the spacious court-yard of the Royal Dublin Society, whose suite of apartments, including the Museum, will be thrown open to the public during the Exhibition. The available area of ground-floor will be 147,704 feet. Of wall space there will be not less than 87,000 feet. The design, not only in respect to the striking and bold effect of the elevation, but also of the interior, is deserving of the highest praise.

THE ELECTRIC TIME-BALL IN THE STRAND.

After the satisfactory completion of the requisite arrangements which had been for some time pending between the Electric Telegraph Company and the Astronomer Royal at Greenwich, Mr. Edwin Clark, the Company's engineer, had intrusted to him the construction the of ingenious apparatus for the development of the electric telegraph system, as applied to the regulation of time on a plan for distributing and correcting mean Greenwich time in London, and at all the principal ports throughout the United Kingdom every day at 1 o'clock. The ball that has recently been raised on a pole upon the dome of the Electric Telegraph Company's West-end station, No. 448, Strand, opposite Hungerford-market (similar to the ball which surmounts the Royal Observatory at Greenwich), which is a remarkable object of attraction to all persons passing to and from the west-end to the city, is now completed. It is about 6 feet high and 16 feet in circumference, made of zinc, and painted of a bright red colour, so that it may be the more clearly discerned at a distance, and can with ease accommodate three persons in the interior. It has a broad white belt round it, thus having the appearance of a "great globe," and at the extremity of the shaft is a cross, or bright gilded weather vane, with the four points, N. S. E. W., and below the arms of the Electric Telegraph Company, with their initials, "E. T. C." Many difficulties have been experienced in the completion of this new idea of electricity, in consequence of numerous obstacles with regard to the correct working of the telegraph wires along the streets of London and the Greenwich Railway to the Royal Observatory. These, however, have been overcome to the great satisfaction of the Directors of the Company and the Astronomer Royal, and for the last three days the experiments have been made with the most complete success, the ball or globe dropping by the electric action simultaneously with the one at the top of the Royal Observatory precisely at 1 P.M., both balls being, in fact, liberated by the same hand. It will be in active operation to-day, and will communicate the standard time of Greenwich and London, by the different lines of railway, to all the principal ports of the United Kingdom and Scotland on the same principle, as arrangements have been made to make it one of the most complete improvements of the present day, not only as regards the time for regulating chronometers on board vessels, but the chief public clocks of the metropol and from one end of the country to the other. An electric dial is now being completed in the midway opposite the office in the Strand which separates the crossings, and yesterday the new lamp, or light, at the top of the post was tested as to its power of reflection, and the dial and electric apparatus will show forth the hour, minutes, &c., both day and night, to the public, which will be a great convenience, especially to the omnibuses, cabs, &c.—*Times, August 19th.*

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING AUGUST 16, 1852.

CHARLES COWPER, of Southampton-buildings, Chancery-lane. *For improvements in multiplying motion applicable to steam engines, saw-mills, and other machinery in which an increase of velocity is required.* (A communication.) Patent dated January 31, 1852.

Claims.—1. A mode or modes of multiplying motion in steam engines, so as to obtain a complete revolution of a shaft from one stroke of the piston (by means of an arrangement of rods and levers.)

2. A mode of multiplying the motion of the pistons of steam engines, and regulating the same.

3. A mode of multiplying the motion of steam engines by the application of an oscillating cylinder in combination with lever arrangements.

4. The application of the invention to saw-mills, punching-presses, and the working of screw propellers.

5. A mode of multiplying motion so as to obtain from a single stroke of any prime mover two, four, or any greater number of strokes, such greater number being in all cases a multiple of the number two.

FREDERICK PHILIP THOMPSON, of Water-works Chambers, Orange-street, Trafalgar-

square,' engineer and surveyor. *For improvements in filtering and preserving water.* Patent dated February 2, 1852.

The nature of these improvements is fully explained in the claim, which is for—

The formation of a covered storage reservoir for filtered water, by the construction of filtered water chambers extending over the area of the reservoir, and the covering of this area by the filtering media employed (and which are preferred to be beds of sand of different degrees of coarseness), thereby forming, as it were, a subterranean filtered water reservoir, by which means the filtered water will be obtained and preserved in a state of coolness, great purity, and freedom from contamination.

GEORGE TORR, of the Chemical Works, Frimley's-lane, Rotherhithe, animal charcoal-burner. *For improvements in re-burning animal charcoal.* Patent dated February 3, 1852.

This invention has relation to revolving retorts, and consists of an improved mode of constructing and setting the same.

The retorts are open in front, and closed at the hinder end, which is supported by a hollow trunnion or axis built into the masonry of the furnace, a space being left between the end of the retort and the masonry, so as to admit of the flame, &c., from the furnace playing against that part of the retort. A pipe is carried through the hollow axis for the purpose of leading away any gases that may escape from the charcoal during its re-burning, and a plate is fixed in the interior of the retort, by which the charcoal is agitated during the revolution of the retort (which is effected by the ordinary means), and all parts of it equally exposed to the action of the heat.

Claim.—The improvements described in constructing and setting revolving retorts or apparatus used in re-burning animal charcoal.

GEORGE SPENCER, of Lacey-terrace, Islington, engineer. *For improvements in the springs of railway carriages, trucks, and wagons.* Patent dated February 3, 1852.

Mr. Spencer's improvements consist in the employment of rings of vulcanized India-rubber in the construction of buffer, bearing, and draw-springs for railway purposes. The claims are—

1. The use of a confining cylinder or case, made of wrought-iron or other material when used for railway carriage buffer, draw, and bearing springs.

2. The use of rings of vulcanized India-rubber, or other suitable elastic material, of certain forms shown, when used for railway carriage buffer, draw, and bearing springs.

3. The combination of rings of vulcanized India-rubber, of various densities or sizes, so as to regulate the resisting power of the springs when used for railway carriage buffer, draw, and bearing springs.

4. The use of any combination of the rings described with a confining case or cylinder, when used for railway carriage buffer, draw, and bearing springs.

5. The use of the combination of a confining cylinder and conical rings of vulcanized India-rubber, or other elastic material, with dividing plates, when used for railway carriage buffer, draw, or bearing springs.

SAMUEL CUNLIFFE LISTER, and JAMES AMBLER, both of Manningham, Bradford, York, manufacturers. *For improvements in preparing and combing wool, and other fibrous materials.* Patent dated February 3, 1852.

The *first* part of this invention consists of an arrangement of machinery for preparing wool and other fibrous materials. This consists of an endless belt travelling over two rollers, the largest of which is the driver, and having attached to it by hinges a number of rods or beaters, which, as the endless belt is carried over the smaller roller, fall on the wool or other fibrous material which is laid on a grating in front of the same, and beat and cleanse it.

The *second* improvement consists in using the gas known as White's water gas, for the purpose of heating combs. One great advantage possessed by this gas over other kinds is, that it burns without much smoke; the arrangements of burners may be varied to suit particular circumstances.

The *third* improvement consists of a method of feeding wool or other fibrous materials on to passing combs.

The *fourth* improvement has relation to Preller's machine, in which a series of combs are placed in succession across the periphery of a drum for the purpose of receiving wool from feed-rollers, and then combing it with a cylinder covered with card teeth. The improvement consists in mounting the bars on which such comb-teeth are set, so that they may turn on axes formed on the ends of such bars, and in using suitable means for controlling such teeth while in action on the wool or other fibrous materials.

The *fifth* improvement consists of a method of transferring wool or other fibrous materials from one carrying comb, or set of carrying combs, to another during the operation of the same.

Claim.—The various improvements described in the processes of preparing and combing wool and other fibrous materials.

EMMANUEL CHARLES THEODORE CROU-

TELLE, of Rheims, France, manufacturer. *For certain improvements in machinery or apparatus for preparing woollen threads and other filaments.* Patent dated February 3, 1852.

These improvements consist in applying pressure to woollen warps whilst undergoing the process of dressing, in order to expel the air contained in the fibres, and cause the size or dressing to penetrate thoroughly into the same. The pressure is applied by means of rollers revolving in the size trough of the dressing machine.

Claim.—The mode described of preparing woollen warps.

ROBERT HESKETH, of Wimpole-street, Marylebone. *For improvements in apparatus for reflecting light into rooms and other parts of buildings and places.* Patent dated February 3, 1852.

Mr. Hesketh's improvements consist in employing a series or combination of reflectors in imperfectly-lighted rooms and other places, so disposed as to receive the rays of light falling into the rooms, and convey them to any or all parts thereof. He also employs, in carrying out his invention, reflectors of a corrugated or indented form, one side of the corrugations or indentations being silvered, and the other left transparent or plain.

AUGUSTE NEUBURGER, of Rue Vivienne, Paris, lamp manufacturer. *For certain improvements in lamps.* Patent dated February 9, 1852.

These improvements have relation to what are known as "Moderator" lamps, and consist—

1. In causing the "cric" to redescend to the level of the burner after having raised the piston to the top of the reservoir cylinder, by which means the range of the piston is lengthened, and the time of burning of the lamp correspondingly increased.

2. In certain mechanical arrangements for increasing and diminishing the length of the ascension tube.

SANDERS TROTMAN, of Clarendon-road, civil engineer. *For improvements in fountains.* Patent dated February 9, 1852.

Claim.—The actuating the hydrostatic bellows in artificial fountains by means of certain systems of compound leverage described.

JOHN SMITH HULTON, of Bolton-le-Moors, Lancaster, bleacher, and JOSEPH MUSGRAVE, of the same place, engineer. *For a certain improvement or improvements in apparatus used in the bleaching of yarns and goods.* Patent dated February 12, 1852.

The "certain improvement" above referred to, consists in applying steam for the purpose of heating the keirs or vats in which the boaking or alkaline process is performed in the operation of bleaching. The keirs are enclosed in steam jackets, through which the steam from a boiler is caused to pass.

Claim.—The application of steam as a heating medium to keirs used in the alkaline or boaking process, such being apparatus used in the bleaching of yarns and goods.

WILLIAM BECKETT JOHNSON, of Manchester, manager for Messrs. Ormerod and Son, engineers and ironfounders. *For improvements in railways, and in apparatus for generating steam.* Patent dated February 9, 1852.

The improvements claimed under this patent are—

1. A method of constructing the framework of turntable tops of wrought iron bars, bent or made in the form of sectors of a circle, and bolted, or riveted, or otherwise connected together.

2. The application of two or more furnaces or chambers applied to a steam boiler in such manner that the products of combustion proceeding from them shall meet each other from opposite directions.

3. The application of tubes to stationary boilers in such manner that the products of combustion shall return through them to the front or firing end of the boiler.

4. A mode of fitting tubes into the tube plates of boilers by causing their ends to be expanded or forced into cavities, or enlarged diameters formed in the ordinary tube holes of the tube plates.

MARTYN JOHN ROBERTS, of Woodbank, Gerrard's-cross, Bucks, esquire. *For improvements in galvanic batteries, and in obtaining chemical products therefrom.* Patent dated February 10, 1852.

CHRISTIAN SCHIELE, of Oldham, machinist. *For certain improvements in obtaining and applying motive power.* Patent dated February 12, 1852.

Mr. Schiele describes and claims—

1. Certain arrangements of machinery for obtaining motive power by the action of steam, water, or other fluid on a species of turbine or rotary cone wheel, and for transmitting the motion therefrom.

2. A species of piston governor, or speed regulator for steam engines and other machinery, wherein the unbalanced pressure on the two sides of a piston in a detached cylinder is made to adjust the throttle valve, or passage for the actuating medium.

3. A means of transmitting power along ranges of pipes or fluid ducts, and of transmitting motion therefrom, and regulating or governing the same.

4. A mode of working the expansion valves of steam engines by means of an

adjustable pendulum action for varying the "cut off."

JOHN MOLLADY, Jun., of Denton, Lancaster, hat-manufacturer. *For certain improvements in machinery or apparatus for manufacturing hats or caps.* Patent dated February 12, 1852.

Mr. Mollady's machinery is intended more especially for manufacturing the soft felt hats known as "rustics," but is also adapted for being used to give form and finish to other descriptions of hats and caps.

The machine may be constructed with any suitable number of sets of moulds, which will, of course, be varied to suit the style of hat under operation. The lower moulds are made hollow, and are traversed by steam, and the upper moulds are heated by contact with the lower ones. The upper moulds are raised by means of levers, and when the hat-forms have been placed in the lower moulds, are caused to descend and to rest upon them with a pressure which may be increased to any desired extent by weighting the levers. The heat of the moulds, and the pressure of the upper ones, causes the hats to assume the exact form of the same, and to be finished in a more regular and expeditious manner than by hand.

Claim.—The manufacture of hats and caps whilst in a dry state, or nearly so, by means of suitably-shaped upper and lower dies, blocks, or moulds, heated by steam or otherwise, whereby the hats and caps are shaped, and pressed between the upper and lower dies, blocks, or moulds.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in the heddles or harness of looms for weaving, and in the machinery for producing the same.* (A communication.) Patent dated February 12, 1852.

Claims.—1. The making of heddles or harness for looms, by casting males or eyes of any suitable form or material (metal or glass) on to wires, cords, strings, or yarns made of any fibrous materials. Also, the exclusive right to such cast males or eyes, whether formed by the machinery described or any other machinery capable of effecting the same purpose, and whether cast on single or double wires, cords, strings, or yarns.

2. An arrangement of machinery, together with several modified forms thereof, whereby metal or other males or eyes may be cast or formed on wires, cords, strings, or yarns.

3. An arrangement of machinery, or any modification thereof, for winding wires, cords, strings, or yarns on to frames, for the manufacture of heddles or harness of looms.

Specifications Due, but not Enrolled.

JOHN STEPHENS, of Kennington, Surrey, esquire. *For improvements in obtaining and applying motive power.* Patent dated February 12, 1852.

CHARLES LOUIS BARBE, of Mulhouse, France. *For improvements in the reproducing of drawings, and in the mode of obtaining designs to be principally used in the engraving surfaces for printing fabrics.* Patent dated February 12, 1852.

The first Iron Screw Collier.—The *John Bowes* has returned from her first voyage, and although the trial was made under rather unfavourable circumstances, owing to the newness of the machinery and gearing, it must be regarded as a great achievement for the coal trade. She left the river Tyne on Tuesday, the 29th ult., the first day that her engines had been put in motion, and went under steam to Sunderland. She began to load at the New Dock, with Hetton Wallsend coals, at twelve o'clock on Wednesday, and sailed with 540 tons of coals at midnight. She reached the Collier Dock, Blackwall, about 12 o'clock on Friday night. She was discharged with the use of Armstrong's hydraulic cranes in eighteen hours, a period altogether unparalleled for the shortness. On her return passage, she sailed on Sunday morning at 12 o'clock, arrived in the Tyne about eight on Tuesday morning, completing the voyage within six days. Coals which left the pit's mouth on the day of her loading, were delivered at the house of the consumer in London, within four days. Her engines being new, were only worked at half speed, and it is anticipated she will, on an average, work the passage in forty hours. The quantity of coals consumed was not quite eight tons. Her appearance in the river Thames excited general admiration, and a large number of the leading members of the coal trade, made a personal inspection. —*Newcastle Chronicle.*

Immense New Iron Steamer.—We understand that Messrs. Burns have contracted with Messrs. William Denny and Brothers, of Dumbarton, to build an immense iron steamer for the Cunard line of Royal mail packets. She is to be upwards of 3,000 tons burthen, and will be more than fifty feet longer than the *Great Britain.* The engines are to be by Napier, and are to be equal to 1,000 horse power, although capable of being worked to a much higher force; in addition to this transaction, which will involve a cost of upwards of £100,000, the Messrs. Burns are about to build two very large screw steamers, to be called the *Jura* and *Ætna*, as consorts to the *Andes* and *Alps*, the most forward of which is to be launched on Tuesday. These are, in addition to the *Baalbec* and *Melita*, now fast progressing towards completion, for their Constantinople line.—*Glasgow Mail.*

The La Plata.—This splendid vessel left Southampton on Monday last, with the West India and Pacific Mails. She had on board 1,380 tons of coals—the largest quantity of fuel perhaps ever taken on board a steamer. It is estimated that the coal of the West India Company used at home and foreign stations averages 30*s.* a ton. Some idea may be formed from this of the enormous expense of working a monster steamer, as the cost of fuel of the *La Plata*, on her voyage from Southampton and St. Thomas, will scarcely be less than 2,000*l.* Mr. Napier, the maker of the engines of the *La Plata*, has offered to wager 5,000*l.* that she will make the voyage to St. Thomas in twelve days, and that her engine power is sufficient to take her there in ten days. The distance between Southampton and St. Thomas is near 3,700 miles, which is 700 miles farther than the distance between Liverpool and New

York. The engines of the *La Plata* register the revolutions of the paddle-wheels on a disc similar to that on a gas-meter. Opposite to the disc a time-piece is placed to show the celerity of the revolutions. The ladies' saloon is, perhaps, the most superb apartment afloat. The gigantic mast passes through the centre of the apartment, and is beautifully carved and painted, and forms a splendid ornament. The panels are formed of slate, and on them are painted exquisite landscapes. The ornamental paintings on board first-rate steamers are of a more subdued character than formerly was the case. Passengers, particularly ladies, have complained that staring pictures looking down on them aggravates the horrors of sea-sickness.

WEEKLY LIST OF NEW ENGLISH PATENTS.

James Lowe, of Charlotte-place, Upper Grange-road, Bermondsey, mechanic, and Thomas Eyre Wych, of George-street, Mansion-house, London, gentleman, for improvements in propelling vessels. August 19; six months.

William Palmer, of Sutton-street, Clerkenwell, Middlesex, manufacturer, for improvements in the manufacture of candles and candle-lamps, and in packing candles and night-lights. August 19; six months.

Thomas Hunt, of Leman-street, Goodman's-fields, Middlesex, gun-maker, for improvements in fire-arms. August 19; six months.

Henry Rawson, of Leicester, for improvements in preparing and straightening wool and other fibrous materials. August 19; six months.

Henry Spencer, of Rochdale, Lancaster, manager, for certain improvements in machinery or apparatus for preparing, spinning, and weaving cotton and other fibrous substances. August 19; six months.

Charles Butler Clough, of Tyddyn Mold, Flint, gentleman, I. P., for certain improvements in machinery or apparatus applicable to the purposes of brushing and cleaning. August 19; six months.

Pierre Armand Lecomte de Fontainemoreau, of South-street, Finsbury, Middlesex, patent agent, for certain improvements in cutting schistus for slates. (Being a communication.) August 19; six months.

Samuel Nichols, of Coldham-street, Nottingham, mechanic, John Livesey, of New Lenton, in the same county, draughtsman, and Edward Wroughton, of New Lenton, in the county aforesaid, mechanic, for improvements in the manufacture of textile fabrics, and in machinery for producing such fabrics. August 19; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Aug. 12	3349	P. Rigby	Liverpool	Washing apparatus for separating metals from sand, &c.
,,	3350	H. Bennett	Liverpool	Double diamond tooth for bone mills.
17	3351	S. R. English	Birmingham	Embossing press.
19	3352	E. Goddard	Ipswich	Gas stove.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Aug. 13	453	H. Chatwin	Birmingham	Metallic covers for tablets.
14	454	W. Beales	Arlington-street, Camden-town	Pocket writing-case.
,,	455	I. Rose	Goodge-street	Cooking-apparatus.
17	456	C. Killinger	Dublin	Driving-seats for jaunting-cars and carriages.
19	457	M. Billing	High Holborn	Noiseless cornice pole and ring.

CONTENTS OF THIS NUMBER.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1516.] SATURDAY, AUGUST 28, 1852. [Price 3*d*., Stamped 4*d*.

Edited by J. C. Robertson, 166, Fleet-street.

CAPTAIN WALKER'S PATENT MARINERS' COMPASS.

Fig. 4.

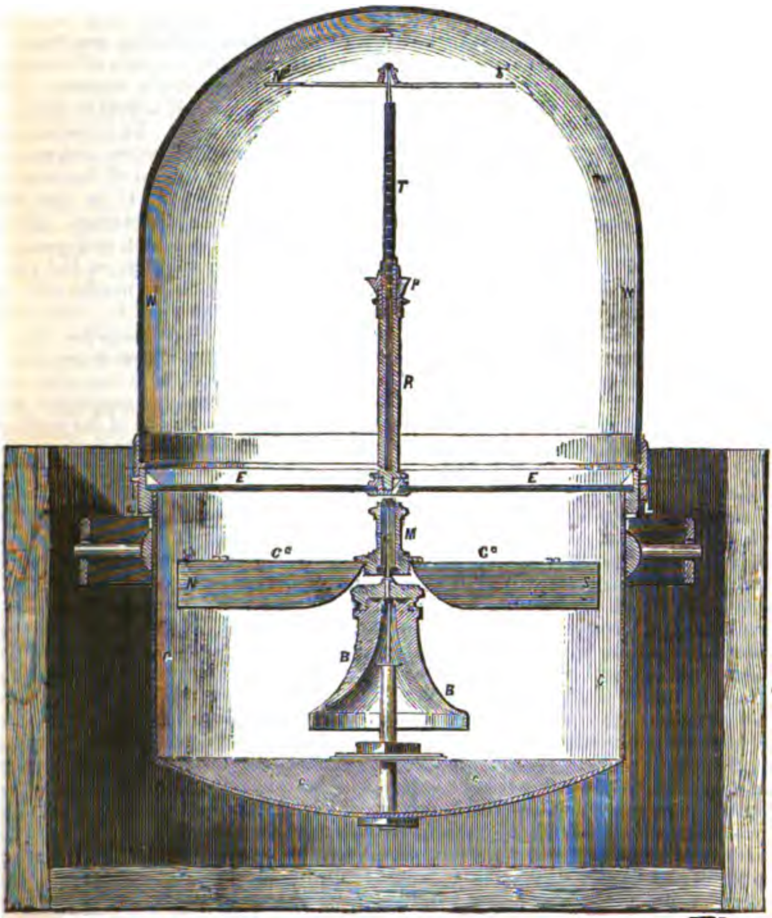


Fig. 5.

Fig. 6.

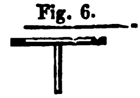
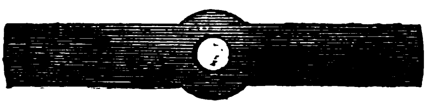


Fig. 7.



CAPTAIN WALKER'S PATENT MARINERS' COMPASS.

(Patent dated February 23, 1852. Patentee, William Walker, Esq., Commander in the Royal Navy, of Plymouth. Specification enrolled August 23, 1852.)

Specification.

It is well known to mariners that a powerfully-magnetised compass-needle is very useful in smooth water, and the more so the lighter it is, for indicating every change of direction in a ship's course, but that the same becomes almost valueless when the water is rough and the ship's motion is considerable, or when the ship is much shaken from any internal cause, such as the action of steam-propelling machinery; in either of which cases the compass-card is never at rest, but in a state of constant oscillation to the extent of several points on each side of the ship's course. The helmsman would, then, prefer to have a heavier compass-card and a weaker needle; that is, an instrument with more matter and less magnetism in it. To explain how this happens, in order that compass-makers and mariners may the better understand the necessity which exists for the improvements which form the subject of the present patent, and the principles on which they are founded, let A, B, C in the diagram, fig. 1, represent the section of a compass-needle devoid of magnetism, poised upon a vertical pivot P; and suppose the arm A C to be equal in length and quantity of matter to C B. Then, by the laws of mechanics, the needle will rest on the pivot P in a perfectly horizontal position, and the centre of gravity of the needle will be in the same vertical line with the point of suspension C of the pivot P. But suppose the needle has been magnetized in some locality where the magnetic dip is considerable—say at London or New York—the needle will then dip as represented in fig. 2, and its centre of gravity be no longer in the same vertical line with the point of suspension C of the pivot P; it would, in fact, become unsupported and unstable, there being more matter on the south than on the north side of the vertical point. To restore horizontality to the needle under such circumstances, compass-makers are in the habit of weighting the lighter arm A C, as represented in fig. 3, where the weight W is supposed to counterpoise exactly the tendency of the needle to dip. Of course, the greater the magnetic power of the needle, the heavier must the counterpoise be, and hence arises another great source of inaccuracy. For though a heavily-counterpoised needle will vibrate independently enough in smooth water, and form, therefore, a tolerably good steering instrument, yet, when the water becomes rough, and the ship begins to pitch or roll, the needle acquires a tendency to maintain a constant oscillation; for as the velocity of the rolling and pitching motion is common to both sides of the compass-needle, it follows that the momentum of the heavier side will be the greatest, and continue to exert a constantly-disturbing force on the needle till the pitching and rolling motion is at its end. It has been officially reported that, in a line-of-battle ship, her compass (a powerfully-magnetized one) performed horizontal vibrations through an arc of 90°, caused solely by the rolling of the ship. In vessels propelled by screws, the results are still further complicated by the exceeding tremor imparted to the whole frame of the ship by the action of the propeller and the machinery by which it is driven—so much so that, in such vessels, the pilots are often obliged to abandon altogether any reliance on the indications of the compass. Again; compass-needles, especially when of great magnetic power, are extremely sensible to what is called local attraction—that is, to any change of a ship's local magnetism resulting from change of geographical position, or from the presence on board of iron substances. And errors arising from such local disturbing forces can at present only be ascertained by taking the bearings of known objects on land, or by correct astronomical observations and computations, made in clear weather at sea. Now the general object of my improvements has been to find a means of obviating or neutralizing these various defects in the existing compass, and to produce an instrument capable of indicating the course of a vessel with correctness, both in fair and in foul weather, in all localities, and under the circumstances of agitation from external or internal causes above referred to, so that the deviations and errors of the mariners' compass may, when necessary, be ascertained and indicated.

Fig. 1.

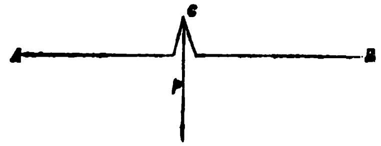


Fig. 2.

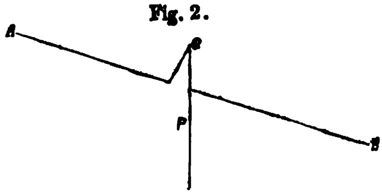


Fig. 3.

The engraving, fig. 4, page 161, exhibits a sectional elevation of an instrument constructed for this purpose according to my invention. A A is the compass-box, constructed, as usual, of wood, and kept everywhere free from iron; C the bowl, which is made, by preference, of copper, because that metal exerts a tranquillizing influence on the needle; *c c*, leaden ballast required for adjusting the bowl on its gimbals; E E, glass cover of the compass bowl; P, the vertical pivot; B, a brass bell or cone, which is poised in an inverted position on the pivot P; F is a fine steel rod or axis, set in brass, which is screwed to the top of the bell B, and carries the compass-card *c c* and main needle N S; M the cap of the needle, which is made one-sixth of the length of the needle, and has at its apex a jewel, on which the point of the rod F works, besides which, another perforated agate is fixed in the lower end of the cap. Care is taken that the axis F shall coincide exactly with the centre of gravity of the needle and cap, and also that the weight of the bell B shall not be more than one-third greater than that of the card, needle, and cap, in order that, as a counterpoise, the horizontality of the card may be maintained. The card should be of equal substance throughout, and, when fastened to the needle, a final adjustment should be made by placing it on an inclined pivot, in order that opposite sides may have equal quantities of matter, and be in equilibrium on the pivot or rod F, on which the card is to perform its horizontal movements. When the needle is thus correctly adjusted, and then (but not till then) magnetized, it will place itself in the direction of the magnetic meridian, and as the quantity of matter and motion of the card will always be equal on opposite sides of the rod F, both in fair and in stormy weather, a compass of this kind is sensitive in smooth water and steady in a rough sea, and on that account superior to any ordinary compass; that is to say, there can be no tendency to mechanical oscillation through inequality of momentum in the card, whilst the power of the needle maintains its northerly direction. R is a slender hollow pillar equal in length to the radius of the compass card, which is passed through the centre of a glass cover E E, and fixed (by a nut and washer) in the same vertical plane as the axis F, and the centre of gravity of the main needle N. S T is a slender rod or style, with steel point, which is contained inside of R, and carries at top a second or indicator needle N^2. $S^2 p^1$ is a screw by which the rod T can be raised or lowered, after the manner of a telescope, so as to increase or diminish the distance between the two needles; and W is a glass dome, which encloses the entire apparatus to protect it from currents of air and electricity, and rests on a ring L, attached to the outside of the compass bowl. Both needles are made of precisely the same description of steel—that is, of fine cast steel, forged from a charcoal fire, and of the form represented in figs. 5, 6, and 7. Both needles are also uniformly tempered throughout; that is to say, instead of tempering them, like ordinary needles, in common fires—which is the cause that such needles so commonly exhibit different degrees of hardness or magnetic susceptibility in different parts—I temper them by heating them in boiling lead, and then cooling them in boiling water. The temperature of boiling lead is a specific quantity, and so also is that of boiling water; con-

sequently every particle of the needles is heated alike, and exposed to exactly the same cooling or indurating influence.

The principle on which the second or indicator needle acts is as follows:—It is known that when two magnetic needles of different *magnitudes*, varying, say, in the proportion of 20 to 1 (which is that adopted in the instrument before described), are freely suspended in the vertical plane of the magnetic meridian, and at a certain distance apart, both needles, if uninfluenced by local magnetism, will place themselves parallel to the magnetic meridian, but with the poles of the lesser needle inverted. This parallelism, however, can only take place where there are no local disturbing forces. The earth's magnetism is common to both needles, and may be regarded as a constant quantity, whilst the attractive force of the two needles on each other may be varied in the inverse duplicate ratio of their distance apart; whence it follows that whenever the main needle is made to deviate from the magnetic meridian by the presence of any local disturbing force, it will, by the magnetic mastery it possesses, cause the small needle to deviate in the same direction. The moment, however, any such deviation takes place, and the needles are no longer parallel to the magnetic meridian, the earth's magnetism then exerts a mechanical power on the small needle (in its inverted position) to turn it round, wherefore the effort which the small needle makes to attain its natural position (assisted by terrestrial magnetism), causes a greater deviation than that of the main needle, though in the same direction. Supposing, therefore, the vertical distance between the centres of gravity of the two needles to be so adjusted (by means of the screw p^1) that the deviation of the small needle shall be to that on the compass-card as 2 to 1, it follows that the small needle will indicate a deviation from the north and south of the compass-card exactly equal to the deviation of the main needle from its correct magnetic meridian, and the amount may at once be read off through the glass dome on the card in the compass-box, which is graduated on the outer edge to 360°, as the quantity in degrees to be applied to correct the ship's course. To illustrate this by an example or two:

Example I. Let the indicator needle point in an exact north and south direction, or to zero, on the compass-card, then the axes of the two needles would be parallel, and no error would be indicated.

Example II. If the indicator needle pointed in a direction north 12°, west and south 12° east, thereby making angles of 12° with the main needle, this would indicate a westerly deviation of 12° to be applied to correct the ship's course or compass bearing.

Example III. Should the indicator be seen to point in a N. B. E. (north by east) and S. B. W. (south by west) direction on the card, this would point out an easterly deviation or error of one point to be applied to correct the compass course or bearing.

Example IV. For the adjustment of height of the indicator:

1. Place the instrument where no local attraction exists, and let the north or zero point of the card and lubber's point coincide; the needles will now be parallel.

2. Let the compass be made to deviate by iron, a magnet, or by hand, 10, 20, or 30 degrees east or west on either side of the lubber-line, and read off the pointing of the indicator needle on the card. If this reading agree with the actual number of degrees the compass is made to deviate, then the instrument is in correct adjustment; otherwise the indicator needle must be raised or lowered until the indicated deviation on the card is equal to the actual deviation given to the main needle in the process of adjustment.

And having now described the nature of the said invention, and in what manner the same is to be performed, I declare that what I claim is the employment in mariners' compasses of a supplementary indicator needle, poised on an isolated and independent pivot, made moveable for adjustment of magnetic intensity, and placed on a vertical plane passing through the centre of gravity of the principal and supplementary needles, for ascertaining and indicating the deviations or errors of the mariners' compass, as before described.

LORD ROBERT MONTAGU'S TREATISE ON NAVAL ARCHITECTURE.

Sir,—I have this evening seen, for the first time, a review of my volume in the 1503rd Number of your Magazine. As your Reviewer has not been either fair or generous, I hope you will, in justice, allow me to say a few words in my own defence.

It is evidently the work of one,

> "With just enough of learning to misquote,
> And mind well skill'd to find or forge a fault."

who has contrived to slip his first literary production into your editorial hands at a time when a press of business prevented you from investigating its truth and justice. The young Reviewer certainly styles himself "the pioneer of the mechanical public," feels himself called upon to patronize and "encourage," and deems himself the duly-constituted guardian of "the Temple of Truth,"—a sort of scribbling Cerberus, in fact.

This guardian, however, commences by insinuating that I "tell positively that a parabola is the proper form for the midship section, and a cycloid for a water-line;" and, gathering boldness as he proceeds, he subsequently plainly asserts the same. For estimating the truth of this statement, I must refer you to page 27 of the second edition of my volume, and also to pages 131, 132.

2ndly. He informs your readers that I give no reason why the dividing lines should cut vertical sections at right angles, and not other sections. I state, in the first place, that the sections are supposed perpendicular to the surface of the water *and to the direction of the motion;* and then define the dividing lines as those which cut the circumferences of these sections at right angles. After this I proceed to give the proof (of which the Reviewer gives a mangled statement), and attempt to show that the water does lapse along such dividing lines.

3rdly. I do not state (as the truthful guardian would have your readers to believe) that a dividing line is the locus of "the intersections of consecutive normals," nor anything like this; for that would be nonsense. The normals to the outside of a ship could not even intersect, except in the particular case of a concave portion of the surface. That which he states about there being *two* such loci at right angles to each other, is either unintelligible or equally ridiculous.

4thly. He would also have your readers to believe that I merely *assert* a dividing line to be the shortest line between any point in the stem-post and the stern. If my proof of this fact be incorrect, why not expose the fallacy, instead of carping at the fact itself?

5thly. He says, "We are told that the metacentre may be below the centre of gravity of the vessel, and yet the equilibrium be stable." Here the truthful guardian omits to state the only condition on which this can be the case. He also contrives to forget that a proof precedes this statement in my book. If he does not agree with the conclusion, he should point out the error in the demonstration, and not find fault with the result because (as he allows) he is ignorant of the mechanical principles on which it is founded.

6thly. He ventures on the gullibility of his readers when he says that "the solids of emersion and immersion must be equal in order to obtain an equality in the vertical forces acting on the ship; and it is *this very necessity which gives rise to the motion of the centre of gravity.*" Or perhaps he is ignorant that one of these solids is below, and the other above the load-water-line.

7thly. He states that I "servilely follow Chapman in adopting a false analogy, &c.," which, being translated "out of English into honesty," means that I *quote* from Chapman. And I say further, that "*if* the analogy be true," certain deductions follow from it, which have been found true, both in practice and from other investigations—thus giving increased weight to the assumption.

8thly. He again tries the gullibility dodge, or else he contrives to forget that, when the surface of the water is inclined, *the forces exerted by the water (cæteris paribus)* move through a similar angle. And

9thly. Undisturbed by conscientious qualms, he waxes bold when criticising the 90th page (second edition) of my book; saying that I estimate the lateral forces "by the simple process of summation." A simple inspection of the figure would set the truthful guardian right upon this point.

10. I never gave any reason for assuming that "the direction of incidence [of the water], the normal, and the

dividing line, are in one plane." But even granting this, why tack on to this assumption a most artfully-managed fallacy, or a most egregious blunder? If the normal and dividing line be at right angles, and θ be the angle of inclination of the direction of a normal, then

$$\left(\frac{\pi}{2}-\theta\right)$$

is the angle formed by the direction of incidence and the dividing line. And the resistance at this point varies as

$$v^2 \sin^2\left(\frac{\pi}{2}-\theta\right),$$

or as $v^2 \cos^2 \theta$. And therefore the "*extraordinary consequence*" (of which he makes so much) is not involved;—nothing is involved but the risk of the great guardian's character, either for truthfulness, or for a knowledge of the most elementary mathematics. Those three notes of admiration at the end of the "extraordinary consequence" might well have been spared. They were meant to call attention to the Reviewer's acumen in discovering the "extraordinary consequence;" but they in fact point, with the finger of scorn, at the guardian of truth himself.

But, Sir, I am trespassing too much on your kindness and sense of justice. Yet allow me to draw attention to just one other point in the Review, about the "quarter of an hour and the pound of lead" (which is graced with six notes of admiration—being outrageously clever. If the Reviewer had glanced at the sheet of errata, he would have seen that this notable "factor" was merely a typographical error; or if he had followed the calculation he might have perceived the same.

I really bear no grudge to the Reviewer. Many other remarks of his (which evidently proceed from a want of acquaintance with mathematics) make me think that all these perversions are not intentional violations of truth. Neither do I wish to criticise the wave principle, which the Reviewer takes this opportunity of propounding with quite a paternal affection, repeatedly caressing and praising it with much warmth; nor will I expose the various absurdities and gratuitous assumptions in his statement of it. If my theory be wrong, I shall feel pleasure at being told of it in a reasonable manner; for it is more agreeable to be corrected than to think that oneself has been the cause of any error. Some kind persons (whom I have never seen) have already mentioned two or three minor matters in the volume; and these have been duly corrected in the second edition (which I was called upon to prepare just two months after the issue of the first from the press.) But utterly useless are the snarls of Cerberus, and the remarks of a guardian of truth, who is such a scrupulous supervisor of the precious article, that he could by no means think of using any of it himself.

I am, Sir, yours, &c.,

ROBERT MONTAGU.

Cromore, Coleraine, Aug. 14, 1852.

To aid the public in forming a judgment on the matters in question between Lord Robert Montagu and ourselves, we now append a few remarks on the letter with which he has favoured us.

And first, we would call attention to the fact, that his Lordship has vouchsafed no reply to a very large proportion of our strictures—for instance, those on his treating water as an elastic fluid, the density of which varies with the pressure applied to it; on his estimating the resistance of water as an *accelerating* force—denying the existence of momentum, or moving force in the case; on his extraordinary mode of treating forces when investigating the relation between the angles of lee-way and of the set of the sail, and on his newly-invented mechanical principle, that in uniform motion "the velocity in any direction varies directly as the impelling force, and inversely as the resistance."

These we presume he classes among the "many other remarks (which evidently proceed from a want of acquaintance with mathematics), which makes him think that all our perversions are not intentional violations of truth." Still as these doctrines of his Lordship have never been laid down in mechanical works, really are *new*, and therefore not admissible without some proof, we cannot conceive it unreasonable to press him for some satisfaction on these points.

Had the matters in the volume with which we had fault to find, been either "minor" or "few," we should have shrunk from the task of publicly exposing them, and taken steps to lay our objections privately before his Lordship,

with a view to the future perfection of his work. But inasmuch as the errors of principle were numerous and grave, and no amount of "minor" alterations could have amended his work, and rendered it any thing but mischievous; the interests of science demanded a public and unsparing exposure—and the very fact of a work so rich in error having so soon reached a second edition is a strong corroboration of this necessity. And here we may take opportunity to correct the irate Lordling's notions of the duties of a scientific reviewer. These do not consist in puffing the indifferent or decidedly bad productions of a member of the aristocracy, or any one else who is anxious to "write himself down an ass;" but in pointing out to the public the nature and amount of information which the study of a scientific work is calculated to afford. His duty is, in fact, to "act as pioneer to the public," to be, if his Lordship pleases, a "Cerberus," a "guardian," aye, and a "faithful" and "truthful guardian" of the interests of science in behalf of the public. If in our endeavour to discharge this duty, we have exposed errors which fatally dispose of Lord Robert's claims to be considered a philosopher and a mathematician, we may naturally expect, and easily overlook the exhibition of a little ill temper.

But we stand alone in our unfavourable remarks. In other periodicals his Lordship and his work have received the highest meed of praise—which has produced so favourable an effect on the public, that he is called upon to prepare a second edition, just two months after the issue of the first, "the snarls of Cerberus," and "the remarks of a Guardian of truth," notwithstanding. His Lordship is, in a word, a very Hercules of science, not to be deterred by obstacles, to others insurmountable, from penetrating as far as he pleases into the forbidden regions. Let us, however, see how the matter stands. His Lordship's publisher is Mr. Colburn. Mr. Colburn is also the proprietor of the *United Service Magazine* and *Naval and Military Gazette*. The volume on Naval Architecture appeared about the beginning of May; and the May Number of Mr. Colburn's magazine opens with a review (we need not add *favourable*) of the volume in question. The same "dodge" ("we thank thee, Lord, for teaching us the word,") which was so ably exposed by Mr. Macaulay in his review of Mr. Robert Montgomery's Poems twenty-two years ago, seems now to be practised in behalf of would-be-philosophers, as well as would-be-poets. Some of the remarks in that powerful review are so much in point, that we cannot forbear quoting them.

"It is amusing," he writes, "to think over the history of most of the publications which have had a run during the last few years. *The publisher is often the publisher of some periodical work.* In this periodical work the first flourish of trumpets is sounded. The peal is then echoed and re-echoed by all the other periodical works over which the publisher, or the author, or the author's coterie may have any influence. The newspapers are for a fortnight filled with puffs of all the various kinds which Sheridan enumerated, direct, oblique, and collusive. Sometimes the praise is laid on thick for simple people." *Edinburgh Review, April*, 1830.

The "dodge" here described has been followed to the very letter. The first flourish of trumpets is sounded in Mr. Colburn's magazine, and echoed through the length and breadth of the land through the *Times*, which contained (as an advertisement, of course,) a copious extract from the *United Service Magazine*, and the peal in the following month is feebly taken up in the pages of the *Civil Engineer and Architect's Journal*. In the present case it was thought best to lay the praise on thick. Thus, "It is a curious feature of the age, that an able work on this all-important subject should have appeared from the pen of a young nobleman, Lord Robert Montagu, a son of the Duke of Manchester, who, in this little volume, has treated it in the most *comprehensive* and *masterly* manner; a more *opportune* or more *welcome* publication it would be difficult to find, as it will be equally valuable to the shipbuilder and the ship-owner—to the mariner and the commanders of yachts. In these pages, which are *profusely illustrated with diagrams*, the *whole science of ship-building* is made plain to the humblest understanding, while the *most valuable suggestions* are made for its improvement in the rig, structure and laying down of vessels." — (U. S. M., May, 1852. p. 1.). And again, "We cannot dismiss this *most valuable* and

unique little work without awarding a high meed of praise to the noble author. Proud may our aristrocracy be, when its sons are seen ranging themselves in the foremost ranks of science, and contributing so large a quota to its researches and to its acquisitions."—(*Ib.* p. 4). Who can be surprised, that with the prestige of the author's birth, the celebrity of his publishers, the interest of the subject, the moderate price of the volume, and the *very flattering* terms in which it is here introduced to the public, among that large class, including yachtsmen and members of the naval profession; who are most anxious to have the principles of naval architecture made intelligible, the demand for Lord Robert's volume should have been so great as to call for a second edition so soon?

On perusing the Review, we were much struck with the strong family likeness between it and the Introduction to the "volume;" and, as if to make it complete, the writer has ventured upon a mathematical statement, in which, with singular address, he runs his head against a post—that the Reviewer of the volume, we presume, might not fall short of the "noble author."

"In Mr. Griffith's book," he tells us, "as well as in Mr. Peake's little volume (in Weale's series), the expression which is taken as the measure of stability is wrongly interpreted. In both these works we are told that

$$\int y^3\,dy$$

must be calculated by taking the cubes of the ordinates in the load-water-line (or the half breadths of the transverse sections at the surface of the water.) This is incorrect. This does not give the value of

$$\int y^3\,dy$$

for the *area*, but merely for the *circumference* of the load-water line. The difficulty of calculating the real value of this expression would be very great, and the operation tedious, were it not for an expedient resorted to by Lord Robert Montagu."

In one respect, the Reviewer is right; for

$$\int y^3\,dy$$

represents neither the quantity required nor anything else; but

$$\frac{2}{3}\int y^3\,dx$$

(where x is the distance of the half breadth, y measured along the fore and aft line from one extremity, and dx is the base of the elementary parallelogram), which enters into the expression for the proper measure of the metacentric stability, is rightly interpreted by Mr. Griffith and Mr. Peake, and wrongly by the Reviewer—as the veriest tyro in mathematical science knows. The moment of inertia of the *circumference* of the load-water-line would be

$$2\int y^3\,dx,$$

which has no relation to the stability whatever. Moreover, the summation of

$$\frac{2}{3}\int y^3\,dx$$

presents no more difficulty than any other ordinary calculation in ship-building. Of the qualifications of the Reviewer in question to sustain his "*rôle*" to admiration in the publisher's periodical "dodge"—in playing the flunky in the introduction of the "Noble Author" to the "gullible" public—we entertain the highest opinion; but for his qualifications to review a work on naval architecture—"*c'est tout autre chose.*"

Thus much may suffice for letting the simple reader into the secret of the success of Lord Robert Montagu's volume.

We shall now address ourselves to the easy task of replying, *seriatim*, to the observations of our Hercules:

1. We did not intend our remarks on the parabolic midship section and the cycloidal water-lines to apply to him, but to others whom we then had in view. His lordship does, indeed, advocate a cycloidal form for his dividing lines; but then these are not transverse sections nor water-lines; and, to do him justice, he does offer a reason for this preference, although, as we have shown, that reason is insufficient and unsound.

2. He says—that "he states in the first place that the sections are supposed perpendicular to the plane of the water and to the direction of motion; and then defines dividing lines as those which cut the circumferences of the sections at right angles." This is a *geometrical*

definition of a dividing line, but gives no satisfactory answer to our question—why a particle of fluid should take such a path? His Lordship says that he gives a proof that the water does lapse along a dividing line, which proof we are accused of garbling. Now our limits would not permit the transcription of this "proof" *in extenso*,—we were obliged to content ourselves with giving the pith of it as faithfully as possible according to our conceptions. And we doubt not any impartial reader, on a comparison of our abstract with the volume itself, would allow that we have succeeded tolerably well. Our difference with his Lordship regards the validity of this proof, for the rejection of which we have given very excellent reasons, which he does not condescend to notice. At the best, this vaunted proof consists in three analogies. Now analogies are most excellent guides to the philosopher in his researches into a new region of science, but they at all times require the greatest care and circumspection in their application, and where these have been bestowed, they have led to most brilliant results; but in the hands of the rash and inexperienced sciolist, they lead to nothing but absurdity and folly. We have abundantly shown that Lord Robert's analogies are no real analogies at all,—that they entirely leave out of the question all the distinctive characteristics of fluids which *must* enter into any theory of their motion. Let him give us a conclusive answer on this point, and we shall be quite ready to withdraw our objections.

3. We really have a difficulty in replying to his Lordship's third observation. To address him on this point is like talking of different shades of colour to a blind man.

It is well known to every real mathematician that, on every continuous surface there are, starting from any point, two lines called lines of curvature, along the consecutive points of which the normals do and must intersect. The labours of the illustrious Monge and his school have placed this fact beyond a doubt, and it consequently takes a prominent place in every text-book on solid geometry used in the University which, the Reviewer in the *United Service Magazine* would say, has had the honour of conferring a degree on his Lordship. If that part of his education has been neglected, we must commend him to his old acquaintances Hymers and Gregory.

4. We did not describe any lines on the surface of the ship as "loci of intersections of consecutive normals;" that would have been, as his Lordship for once rightly apprehends, an absurdity; for such loci would generally lie inside the ship, remote from all contact with the water. We described them as lines or directions *indicated* by the intersection of consecutive normals, which is quite a different thing Moreover, we speak of them afterwards under their technical appellation of lines of curvature, his ignorance of which by no means tends to raise Lord Robert Montagu's character as a man of science. The least, surely, we can fairly demand of a man who pretends to trace the path of a particle of fluid on a surface, is an acquaintance with the well-known and established properties of surfaces. We are quite content, in company with such men as Monge and Dupin, to be thought by his Lordship unintelligible and ridiculous.

Further, we say that his statements amount to our description, in fact; that is, virtually, not expressly. Let any mathematician decide whether the reason given at page 13 (first edition) does not fully bear us out in this statement: "The reason why the water passes along the body of the ship in lines which cut the vertical sections at right angles is, that the ship's sides at every point (when the ship is in motion) give an impulse to the water, which impulse is normal to the surface of the side at that point. And therefore the *plane* in which the directions of the impulses from two adjacent points must be contained, must, of necessity, cut at right angles the surface of the ship's side which lies between." We are not now concerned with the validity of this reason in a physical point of view, nor with the consistency of its several parts in a geometrical point of view (which will naturally come under consideration in our remarks on the 4th observation.) But supposing, for the sake of argument, the statement to be correct, it is necessary, we are told, that the directions of the impulses—that is, normals to the surface at successive points—lie in a *plane;* hence they must intersect or be parallel! they cannot be parallel unless the surface be a plane.

Hence, according to this statement, the successive impulses must take place at points where the consecutive normals intersect—that is, in a line of curvature.

The true question is, not whether a dividing line be the shortest distance that can be drawn from a point in the stem to the stern, but whether a particle of fluid will take that direction. We are called on to expose the fallacy of this statement. Our answer is, that we have done so abundantly in our review, to which the reader is referred. Lord Robert very properly tells us, that a body moving under the action of gravity will pass from one point to another in space in the *shortest time* along the arc of a cycloid. The shortest distance between the two points is a straight line, along which, however, the body would not proceed in the shortest time. Yet, *because* a dividing line is the shortest line between a point in the stem and the stern, *therefore* a particle of fluid will take that path. Why should *time* be an element in the path of a body acted on by gravity, but not in the more complicated path of a particle of fluid? His Lordship, as we have shown, utterly misapprehends the "principle of least action," which would be easy enough of application if it merely asserted that Nature requires every particle to take the *shortest* path it can find, no matter what forces act upon it. Moreover, we do deny that a dividing line described as Lord Robert proposes—perpendicularly to each transverse section—would be the *shortest* line on the surface of the ship between a point in the stem and the stern. It would be a line whose *projection on the body-plan* is the *shortest* that could be drawn on that plan; but this is not necessarily the projection of the *shortest line on the ship.* It would be so, if the surface were cylindrical—otherwise not. The fallacy involved in his Lordship's proof is, that a transverse section contains all the normals at the several points through which it passes, which is by no means the case. This fallacy is also involved in the "reason" quoted above, where we are told "that the *plane* in which the directions of the impulses (which are normals to the surface) from two adjacent points must be contained (which, we presume, designates the dividing line, or the "proof" is not to the point at all), must, of necessity, cut at "*right angles* the surface of the ship's side that lies between."

5. That stability of equilibrium in a floating body can, under any possible circumstances, co-exist with a position of the metacentre below its centre of gravity, is so glaring an absurdity that we may well be excused citing the "noble author's" only condition on which this can be the case. We asserted broadly that there is no such condition, and gave an excellent reason for that assertion in our review. Moreover, we pointed out the error of the method by which the stability is calculated, and which leads to so notable a result. We should have thought that so ingenious and "'cute a human" as the noble Lord would have penetrated our meaning when we said, "On what mechanical principle this assumption is made, we are at a loss to conceive." To prevent mistakes, we now assert that there is no such principle, or if there be, that it is a creation of his Lordship's brain. The *onus probandi* therefore rests with him, not with us.

6. Proceeding onward, our Lordling's indignation waxes hot against his impertinent reviewer, and he begins to impute dishonesty, stating that he ventures on the gullibility of his readers. As he seems to find an especial satisfaction in this idea, although, like all angry men, he sometimes contradicts himself, attributing our "perversions to ignorance and unintentional violations of truth," and as he really wants something to console him in the disappointment of his fondest hopes, we care not to cross him in his humour.

Nevertheless, we still stoutly maintain the fact which rouses the "noble author's" indignation, that the solids of immersion and emersion must be equal, although one is below and the other above the water-line. For since the vertical pressure of the fluid is still equal to the weight of the floating body, and therefore to the weight of the fluid displaced; the total volume immersed must be of the same amount, both in the upright and inclined position. This equality of volumes can only be maintained by so much of the solid being raised out of the water during the inclination as is immersed in it; that is by the solid of emersion being equal to the solid of immersion.

His Lordship will gain additional information on this point (which he much needs) in No. 1452 of the *Mechanics' Magazine*, where we did unto Mr. Griffith what we did in No. 1503 unto his Lordship, and are ready to do unto any man, be he simple, or be he noble, who ventures to "gull" the public with so much bad philosophy, and (if possible) worse mathematics on this "all-important subject."

7. In No. 1453 of the *Mechanics' Magazine*, he will find something equally new to him regarding the rolling and time of oscillation of a ship. For moderate angles of heeling, we gave you as being approximately true the formula,

$$T = \frac{\pi k}{\sqrt{g\left(\frac{\mu A}{W} - d\right)}}$$

When T is the time of oscillation of the ship, k its radius of gyration, about an axis parallel to the axis of motion through the centre of gravity; d the distance between the centre of gravity of the ship and displacements; μ the weight of a cubic foot of water; W the weight of the ship, A the moment of inertia of the plane of flotation, and therefore,

$$\frac{\mu A}{W} - d,$$

the *metacentre* measure of stability; and the true axis of rotation at any moment is defined by the intersection of the perpendiculars let fall from the centre of gravity of the ship, and from the point in the intersection of consecutive water lines, which lies in the same transverse section with the centre of gravity. Chapman's Analogy, which the "noble author" quotes, or rather half quotes, supposes the ship to oscillate about a point below the keel as the centre of suspension; the centre of oscillation being the metacentre. It so happens that the means proposed by writers who follow Chapman to increase the time of oscillation succeed, though not for the reasons assigned, as it is evident that the true conception of the motion and Chapman's are as different as possible. Thus some writers (not Lord Robert Montagu) propose to increase the time of oscillation; that is, according to their notions, lengthen Chapman's pendulum by *raising* the ship's centre of gravity; this, of course, they effect by lifting some of the weights. This does produce the effect desired; for by this means d and k are increased; on both which accounts, as is evident by inspection of the formula, T is increased. The stability, however, by this process is diminished, and therefore the ship will not deepen. Our formula shows how *infallibly* the stability may remain unchanged, and yet the time of oscillation be increased; viz., by moving the weights *horizontally* from the centre to the sides without *raising* them: which recommendation we allow Lord Robert gives, although not on the right grounds.

8. We really should like to know what is meant by the forces exerted by the water moving (*cæteris paribus*) through a similar angle? although it seems in our anxiety to gull the public we had contrived to forget this notable and patent fact; which, however, we still, in our "ignorance" or "artfulness," assert to be as arrant a piece of nonsense as any that is to be found in the immortal works of Mr. Griffith or Lord Robert Montagu. Neglecting the comparatively small *disturbance*, which produces the wave, *gravity* is the only force that acts on the water; and we must therefore have the volume immersed equal to the weight of the vessel, as usual. Hence if the vessel be stable, it will strive to assume such a position that the line joining the centres of gravity of the ship and of the displaced fluid shall be vertical. This case differs from the common case of equilibrium on a *level surface* in that the volume displaced will be of a different shape, and its centre of gravity in a different position. This subject will bear a further development, which the limits of space require us to postpone to another occasion.

9. Our remarks on the method of finding the centre of lateral resistance were guarded with the proviso, "as far as we can penetrate the author's meaning," which is a sufficient answer to the observation on this head.

Our "noble author," who is so great in proofs when analogies will serve his turn, had here a noble opportunity of giving a strict demonstration of his proposed new method, which he has most unaccountably omitted. Unfortunately, we can learn nothing satisfactory from a

simple inspection of the figure. Our deplorable state of darkness, therefore, merits some compassion from the magnanimous author, who alone can give a proper direction to our "conscientious qualms" should they become troublesome.

10. We have searched in vain every possible nook and corner of the copy of the first edition, which our bookseller procured for us, for a Table of errata, and therefore must stand so far excused for supposing that to be an error of principle, which it seems was only an error of typography, and which is certainly corrected in the second edition.

But, alas! on the general question of resistances, we are as much at issue with the noble Lord as ever.

The mathematical investigations are so confused, and their connection with the dividing line so obscure, that we might well be spared the unprofitable task of wading through them. However, we will accept the challenge, and endeavour to make something out of them. In the meantime, as we were told only "that the resistance varied with the inclination of oB (the dividing line) to the direction of motion," and it was not stated according to what function of that direction it varied, it was as natural (and *more in accordance with analogy*) to suppose that it varied as the cosine or as the sine, although it now seems we ought to have made the latter supposition. It was stated also in the introduction, "Those mathematical formulæ which have relation to a fluid at rest, are unaffected by the present theory; but those of which the subject was the motion of a vessel through the water, must all be altered; for they are calculated on the assumption that the water passed along the surface of the vessel in the direction of water-lines, or in horizontal planes; while, in fact, the curve which any particle of water would describe is totally different." Now by making the assumption which it now appears ought to have been made, we should have arrived at a result so painfully resembling the common expression viz., $v^2 \cos^2 \theta$, which we are told *must* be altered, that we were obliged, out of respect to the author's feelings, to try the cosine. Hence originated that "most artfully-managed fallacy, or most egregious blunder," with which we are reproached.

To return, however, to our main discussion. We exposed, in our Review, Lord Robert Montagu's fallacy in asserting that "the mathematical formulæ of which the subject was the motion of a vessel, must all be altered; for they were calculated on the supposition that the water passed along the surface of the vessel in the direction of water-lines or in horizontal planes." The formulæ in question do no such thing; if any supposition is made, it is that the fluid particles are *annihilated;* they take no cognisance whatever of the lateral escape, and as there must be escape in some direction, it matters nothing as regards these formulæ whether that direction is horizontal or vertical—a water-line, a dividing line, or any other line.

The noble Lord's theory, and calculations founded on it, are, as far as we can understand, as follows:—That part of the pressure due to the velocity, that is, the resistance, is normal to the body at the point of impact, but varies with the inclination of the direction of incidence to the dividing line. If there were no friction, the velocity along the dividing line would be the same as that of impact; and in making the calculation, we are expressly told that friction must be neglected. However, the alteration of *density* of the water, being an elastic fluid, at the bows and stern, diminishes the *relative* velocity at the bows, and increases it at the stern. Hence v being the velocity with which the particles impinge, which is also the velocity along the dividing line, the force exerted in consequence on a unit of surface is represented by

$$p = \frac{v}{t},$$

this force not being a moving force because there is no momentum in the case. This at the bows becomes, for the cause above mentioned, $p - e$, and at the stern $(p + m)$. How does the noble Lord propose to submit this ambiguous force to calculation? v we suppose, in accordance with his statements, to be the velocity of impact or the velocity along the dividing line. But how is it to be measured? And further, let it be plainly pointed out to us from what hydrodynamical investigation it results that the pressure of water by a particle of fluid in motion admits of such measure.

Further, m being the area of an element of the surface included between two consecutive dividing lines and lines perpendicular to them; λ, μ, ν, the angles which this element makes with the planes of xy, xz, and yz (the axis of x being the direction of motion), "the increase of pressure normal to the surface on the area m, which is caused by the vessel's motion, we are told $= mp^1 \cos^2 \nu$, where ν of course measures the angle between the *normal* and the direction of motion. Where, since p^1 is not a moving force, the increase of pressure is not a moving force, consequently not a *pressure*."

What connection this formula has with the dividing line, how it represents the fact that the increase of pressure varies with the angle between that line and the direction of motion, we are at a loss to conceive.

Moreover, taking Lord Robert's own measure of this increase of pressure, if v be the relative velocity of the vessel at the bows, $v \cos \nu$ is the velocity normal to the surface at the moment of impact (which is also the velocity along the dividing line);

$$\frac{v \cos \nu}{t}$$

is the measure of p^1, and is already *normal* to the surface: this for the elementary area $m = mp^1 \cos \nu$ (putting

$$p^1 = \frac{v}{t}.)$$

not $mp^1 \cos^2 \nu$.

When once the amount of this pressure (which is no pressure) is obtained, it may be resolved in any direction we please; and therefore the substitution of dividing lines for horizontal sections is no gain.

No mathematician can have any difficulty in pronouncing on the merits of this wonderful process, which we have endeavoured fairly and reasonably to abstract from the "little volume."

We have now, we believe, accomplished our promise, in setting fairly before our readers the theory of dividing lines as affecting resistance, which is the grand discovery of Lord Robert Montagu. Here we take leave of him and his publisher's periodical "dodge," which has proved so successful, with one little word of advice. Let him, by all means, if he wishes to pursue science, make a judicious selection of a mathematical dry-nurse, of which he stands in so much need: we shall then be spared the troublesome and invidious task of exhibiting his long ears for the amusement of our readers. One word, in conclusion. His Lordship speaks of our "paternal affection" for the wave theory. We are really quite innocent of the soft impeachment. The honour of paternity belongs to Mr. Scott Russell alone,—a gentleman whom we have never seen, and to whom we have applied in vain for some account of his theory. It is because we believe that future progress in the theory of resistances, and hence to the discovery of the form of least resistance, will result from treating the disturbed fluid as a *whole*, and not as split into separate particles; it is because we conceive the wave of translation, measuring as it does the whole fluid displaced, in consequence of the motion, to bear a direct relation to the resistance to the vessel's progress, that without binding ourselves to the particular details of Mr. Scott Russell's system, we do recognise in his principle important consequences at present, perhaps, only "looming in the distance."

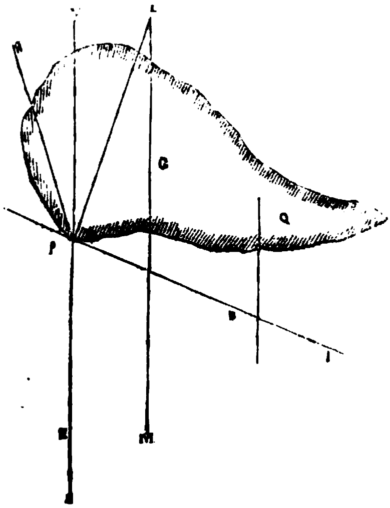
We probably take a more comprehensive view of his theory than the ingenious inventor himself. But we do not on that account undervalue his services—his mathematics may not be faultless, but he has taken a step in what we conceive to be a right direction; and this in science often conducts to the most brilliant and unlooked-for results.

For ourselves, personally, we can very well afford to labour under the imputation on the part of Lord Robert Montagu, of want of acquaintance with mathematics. We have no need of applying to him for a testimonial of proficiency—which we received from men of far higher note than he can ever hope to be, long before he began to dabble so unprofitably in scientific research. But it is not by such authorities that the present issue must be decided. Lord Robert Montagu's volume and justification are before the world, together with our remarks. Let *mathematicians* judge between us, and we, for our part, shall be quite content.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—Although the investigation of "*Workman*" printed in your last Number is ill calculated to cast any additional light upon the fated question of the *Exciseman's Staff*; yet, as he appears not only the advocate of his own views, but also as the exponent of the collected wisdom of a whole *posse comitatus* of mathematical friends; it may, perhaps, be worth while to examine carefully into one or two of these very slippery *Workmen's* conclusions.

For this purpose I shall borrow a portion of "*Workman's*" diagram from page 124, together with his investigation complete as far as equation (3).



"A material body A P B rests upon a point P by means of the friction at P, and a force F acting upwards at a given point Q parallel to gravity. Required the equations of equilibrium."

"Let G be the centre of gravity of the body, and draw G C, Q D, perpendicular to P D, a line touching the body at P."

"Put W = the weight of the body acting at G.; F = the force acting vertically upwards at Q; R = the pressure at P in a vertical direction E P; μ = coefficient of friction; $\beta = \angle$ D P E."

"Because the forces R and F act parallel to the force of gravity, and in the same direction, therefore we shall have

$$R = W - F \,\ldots\ldots\ldots\; (1)."$$

"In order to obtain the normal pressure at the point P, the force R must be resolved in a direction perpendicular to the tangent P D. Therefore the normal pressure at P = R . sin. β."

"Now the friction at the point P is equal to the rectangle of the normal pressure and the coefficient of friction. Then the friction at P = μ R sin. β =

$$\mu (W - F) . \sin. \beta \,\ldots\ldots\ldots\; (2)."$$

"It will be readily seen that W . cos. β = resolved force of gravity in the direction P D. F. cos. β = resolved force of F in the direction D P."

$$" \therefore \mu (W - F) \sin. \beta + F . \cos. \beta = W . \cos. \beta \,\ldots\ldots\ldots\; (3)."$$

Now this being the first conclusion of any importance which "Workman" arrives at, I propose to prove it an absurdity, and then I shall make him a present of the rest of his extremely servile production.

Through G draw the vertical L M, and produce the normal P L to cut L M in L; draw P R to make with the normal the angle L P R = ϕ the limiting angle of resistance *proper to the particular surfaces in contact*, and produce E P upwards to V.

Now, the direction V E of the pressure R, falling *within* the limiting angle of resistance, no pressure however great applied in that direction, or parallel to it, can make the surfaces *slip* upon each other. Hence, for every position the body can be made to assume (and of course they are infinite in number) within the limits

$$\beta = \left(\frac{\pi}{2} + \phi\right) \text{ and } \beta = \left(\frac{\pi}{2} - \phi\right).$$

This equation (3) becomes an absurdity, as no slipping can take place.

As the resultant of the forces does not pass through the fixed point P, the body, subject to the conditions above assigned, may rotate about P, and therefore the *friction of rolling* will apply and must be considered in the equation of moments, both in the *superior* and

inferior states, and hence the observations of "Workman" upon this point are erroneous.

When the direction V E of the pressure R, coincides with the limiting direction P R, the body will be upon the point of slipping—either in the direction P D or D P, according as the normal to the surfaces lies upon the right or the left side of V E.

When the direction V E falls *outside* the limiting angle of resistance, the body cannot be sustained by friction, and if the force Q be supplied by the buoyancy of a fluid, the body will *slip* at P, and also *rotate* about that point, and hence the friction at P will in such case be compounded of the friction of *slipping* and *rolling*; and the axis of the body cannot be inclined to the horizon at an angle *greater* than the angle of friction, although that inclination may be anything *less* to zero.

The most extraordinary mistake connected with the discussion of the Exciseman's Staff Question, are the attempts which have been made to prove that the *inclination* of the cylinder to the horizon is equal to the angle of friction between the surfaces at P; whereas, it ought to be abundantly plain that the latter depends *solely* upon the *nature* of the surfaces in contact.

In conclusion, permit me to assure "Workman," and his "several interested friends," that I, for one, can take no umbrage at any little circle of individuals mutually reciprocating the complimentary terms—"my friend's general solution;" "my friend's elegant generalization;" "distinguished mathematician," and so forth; but it can be no harm at the same time for others to know, that with all these high-sounding pretensions, there does not appear to be enough of mathematics amongst the whole of those amiable gentlemen to enable any one of them to correctly solve a simple case of equilibrium, when it happens to be affected by the strange element of statical resistance.

Yours, &c.,

T. S.

August 19, 1852.

GIGANTIC TELESCOPE AT WANDSWORTH COMMON.

The construction of a monster reflecting telescope by the Earl of Rosse constituted for a considerable period a prominent topic of interest and conversation in the scientific world. The patience and perseverance of the noble projector under every kind of discouragement, and the unwavering faith with which, at a large outlay to himself, he prosecuted his enterprise to a successful conclusion, secured to him the admiration and esteem of all who took an interest in the higher departments of science, while the discoveries that have since been made through its instrumentality have amply borne out his anticipations and rewarded his exertions. It was necessary, however, that something further should be accomplished. To those not conversant with the subject it may be necessary to state that a reflecting telescope on a large scale must always be a work of exceeding difficulty, and comparatively limited utility. The possibility of constructing an achromatic instrument of a power equal to Lord Rosse's, and through which the object looked at could be directly magnified (as with an opera-glass), has long been considered extremely doubtful; in fact, beyond the reach of mechanical and optical appliances. This desideratum is, however, now on the eve of being supplied.

In the course of a recent ramble on Wandsworth common our attention was attracted by a singularly-looking structure, consisting of a plain tower with a long tube slung by its side, surrounded by a wooden hoarding to keep off intruders. On making inquiries we learned that it was a new monster telescope on the achromatic principle in progress of construction, under the superintendence of Mr. W. Gravatt, F.R.S., for the Rev. Mr. Craig, vicar of Leamington. Having obtained an introduction, we inspected the instrument, and ascertained some particulars respecting it which may not be uninteresting. The site, consisting of two acres, has been liberally presented by Earl Spencer in perpetuity, or so long as the telescope shall be maintained. The central tower, consisting of brick, is 64 feet in height, 15 feet in diameter, and weighs 220 tons. Every precaution has been taken in the construction of this building to prevent the slightest vibration; but, if any disappointment in this respect should arise (which, however, Mr. Gravatt does not anticipate), additional weight can be obtained by loading the several floors, and the most perfect steadiness will be thus insured. By the side of this sustaining tower hangs the telescope. The length of the main tube, which is shaped somewhat like a cigar, is 76 feet, but with an eyepiece at the narrow end, and a dewcap at the other, the total length in use will be 85 feet. The design

of the dewcap is to prevent obscuration by the condensation of moisture, which takes place during the night, when the instrument is most in use. Its exterior is of bright metal, the interior is painted black. The focal distance will vary from 76 to 85 feet. The tube at its greatest circumference measures 13 feet, and this part is about 24 feet from the object glass. The determination of this point was the result of repeated experiments and minute and careful calculations. It was essential to the object in view that there should not be the slightest vibration in the instrument. Mr. Gravatt, reasoning from analogy, applied the principle of harmonic progression to the perfecting of an instrument for extending the range of vision, and thus aiding astronomic research. By his improvements the vibration at one end of the tube is neutralized by that at the other, and the result is that the utmost steadiness and precision is attained. The ironwork of the tube was manufactured by Messrs. Rennie, under the direction of Mr. Gravatt. The object-glasses are also of English construction, and throw a curious light upon the manner in which an enlightened commercial policy has reacted upon and promoted the advancement of science. Up to a recent period the flint glass for achromatic telescopes was entirely of foreign manufacture. Since the reduction of the duty great improvements have been made in this department. The making of the large flint glass was intrusted to Mr. Chance, of Birmingham, who at first hesitated to manufacture one larger than 9 inches in diameter. Upon being urged, however, by Mr. Craig, he has succeeded in producing one 24 inches; perfectly clear, and homogeneous in structure. Besides this, there is a second of plate-glass of the same dimensions, cast by the Thames Plate Glass Company, either of which the observer may use at his option. The manner in which these object-glasses are fitted into the tube is a marvel of artistic invention. By means of twelve screws, numbered according to the hours of the day, they can be set in an instant to any angle the observer may require, by his merely calling out the number of the screw to be touched. The object-glasses also move round in grooves to whatever it may be considered that a more distinct view can be gained. The tube rests upon a light wooden framework, with iron wheels attached, and is fitted to a circular iron railway at a distance of 52 feet from the centre of the tower. The chain by which it is lowered is capable of sustaining a weight of 13 tons, though the weight of the tube is only 3. Notwithstanding the immense size of the instrument, the machinery is such that it can move either in azimuth, or up to an altitude of 80 degrees, with as much ease and rapidity as an ordinary telescope, and, from the nature of the mechanical arrangements, with far greater certainty as to results. The slightest force applied to the wheel on the iron rail causes the instrument to move horizontally round the central tower, while a wheel at the right hand of the observer, by a beautiful adaptation of mechanical powers, enables him to elevate or depress the object-glass with the greatest precision and facility. So easy, in fact, is the control over the instrument in this respect, that a very slight touch on the wheel lifts 10 cwt. It may be observed, also, that there cannot be the slightest flexure in the tube; no error or deflection arising from that cause can occur, while the ease with which it can be directed towards any point of the heavens will enable the observer to make profitable use of any patch of clear sky, however transient it may be. The great value of this need not be pointed to those accustomed to making astronomical observations. With respect to the magnifying power of this novel instrument, it is only necessary to state that, though the focus is not so sharp as it will be shortly, it has already separated the nebulæ in the same way as Lord Rosse's. It has also separated some of the double stars in the Great Bear, and shown distinctly a clear distance of 50 or 60 degrees between them, with several other stars occupying the intervening space. Ordinary readers will better understand the extraordinary magnifying power of the telescope when we inform them that by it a quarter-inch letter can be read at the distance of half a mile.

The preparations for this really national work have been progressing for the last two years under the superintendence of Mr. Gravatt as engineer and mathematician, but is only about three months since the superstructure at Wandsworth common was commenced, and it is already near completion.

We understand that the Observatory is likely to be endowed by its liberal and enlightened creator. It will not only be a lasting monument to his enterprising devotion to science, but an admirable illustration of the perfection to which the mechanical arts have attained in this country.

Lord Rosse has visited the Observatory, and expressed his admiration of this novel and interesting invention.—*Times.*

GREENWICH TIME SIGNALS.—MODE OF OPERATION.

The operations for transmitting true Greenwich time automatically from the Royal

Observatory by electric telegraph, and which have aalredy been described (*ante*, p. 156), are now completed, and in practical operation on the South-Eastern Railway.

At noon and at 4 p.m. a single beat or deflection of the telegraph needle is visible at London, Tonbridge, Ashford, Folkestone, and Dover, which represents Greenwich mean time. The first time signal from Greenwich was taken experimentally by Mr. C. V. Walker, in the clock-room at the London terminus, at 4 p.m., August 5, passing down to Dover. The 11 a.m. signal, on August 9, was received at London in the presence of Dr. O'Shaughnessy, of Calcutta; and the noon signal of the same day in the presence of Mr. Herbert, the secretary of the South-Eastern Railway Company. Since that time experiments have daily been made, and the necessary adjustments completed; and the daily transmission of time commenced at noon, August 19, and will be continued from day to day. At 2 p.m., the signal will pass in like manner automatically to stations on the North Kent line; and arrangements are in progress by which all stations on the South-Eastern lines of railway shall have true time at least once a day.

The methods of accomplishing this may be readily understood. A train of wheels has been constructed by Mr. Shepherd, which is kept in motion by Mr. Carter's large clock at the London terminus. Certain of these wheels carry one or more pins or studs, according to the number of signals required, and the hours at which they are required. In the common state of things, when these studs are out of action, the wire leading from Greenwich Observatory rests on the wire that will eventually lead to Lothbury, or the Strand; and the wire leading from Dover rests on a wire leading to the earth, and terminating at London; that is to say, springs tipped with platinum, and terminating these wires rest on each other. But on the approach of noon, as things are now settled, a pin inserted for this hour thrusts forward this cluster of springs; and a pin in the wheel, that revolves once in the hour, which at other times passes clean up the springs, now comes in contact with the Dover spring, and, at about 1½ minutes before the hour, lifts it into contact with the Greenwich wire, at the same time clearing the latter from the Lothbury or Strand wire; and it holds it in this position for about 2½ minutes, thus connecting Dover with Greenwich ready to receive the signal.

At Greenwich, Mr. Shepherd's electro-magnetic clock is in action. It is connected in such a manner with the wire leading from London, that precisely on the 60th second of the last minute of the hour, a connection is established between a spring attached to this wire and another attached to the ordinary sand-acid battery used for telegraph purposes, and a signal of instantaneous duration passes.

Mr. Carter's clock pursues its course, the pin passes forward, the Dover wire returns to its place, and the wire is again free for telegraphic purposes, until another pin arrives and thrusts forward the springs, which, in this case, will be 4 p.m.

In respect to the Lothbury wire, this connection is not yet established, but will be in a few days, when the Electric Telegraphic Company will have the means of taking a time signal at any of the remaining twenty-one hours, and having it visible, both by dropping the ball that has been erected in the Strand, and by distributing it throughout the kingdom along the various lines of railway.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING AUGUST 23, 1852.

Edmund Morewood, of Enfield, and George Rogers, of the same place. *For improvements in the manufacture, shaping, and coating of metals, and in the means of applying heat.* Patent dated February 13, 1852.

The first of these improvements consists of a method of coating zinc with lead. The slab or sheet of zinc to be coated is placed on a plate of cast iron, which is heated so as to raise the temperature of the zinc above the melting point of lead. When this is the case (which may be ascertained by applying to the zinc a thin stick of lead), the surface of the zinc is covered with a sprinkling of sal ammoniac, and stick lead is rubbed on until a more or less thick coating is obtained. Molten lead is then poured on in quantity sufficient to produce the desired thickness of coating. The edges of the zinc should be surrounded with sand, to prevent the lead flowing away. As soon as the lead has set, the compound slab may be extended by rolling, or it may be allowed to become quite cold.

Another improvement consists in a mode of coating zinc, or hard alloys of that metal, with lead, tin, or alloys thereof. The zinc, having been first coated with lead as above described, is laid in a mould of the required depth, and secured therein by any suitable means, leaving a space between the zinc and the bottom of the mould when the metal is required to be coated on both sides, and fill-

ing up that space with sand when the coating is to be applied to one side only. The mould, and zinc in it, are then immersed in the melted lead, the surface of which should be covered with a flux (by preference, sal ammoniac), the mould being entered into the bath in a vertical direction, then brought to a horizontal position, and so withdrawn, after which the compound slab is set aside to cool, or it may be rolled as soon as the lead has set sufficiently to enable it to undergo this operation. When rolling coated zinc, the patentees prefer to subject it to a previous hammering or forging, in order to break down the grain of the metal.

Another improvement has relation to the extension into sheets of zinc coated with lead, &c., by immersion. The zinc to be coated having been previously cleansed with dilute muriatic acid, is dipped into the molten lead, the surface of which is covered with a flux, as before, and this dipping is repeated until the required thickness of coating is obtained. As soon as the lead has set, or is cold, the compound slab is rolled between rollers, the surface of which has been slightly hollowed. The surface of the metal to be rolled is to be smeared with grease, in order to prevent sticking. The zinc to be coated by immersion in this way should not be too thin, or it would be liable to be broken; and the temperature of the lead should be only just sufficient to keep it in a state of fluidity.

Another part of the invention consists in the use of sand, mixed with sal ammoniac or other suitable chloride, as a flux when coating metals such as iron with zinc, by which means a considerable saving is effected in the quantity of flux consumed, and in the consumption of fuel for maintaining the requisite degree of heat. Powdered charcoal, coke, or loam may be also used instead of sand.

Another improvement consists in the use of a lighter metal floating on the surface of a heavier one for coating purposes. Thus, when lead and zinc are used together, a division bar or plate would be placed across the top of the lead bath, and on one side of this bar the zinc would be melted on the surface of the lead. The metal to be coated would be introduced into the coating bath on that side of the division bar where the zinc is floating, and passed under the bar and withdrawn on the other side. The surface of the floating bath would be covered with a flux, as before mentioned; and in selecting metals to be used in this manner, those should be chosen which do not readily combine with each other.

Another improvement has relation to the coating of wire, wire chains, &c., and consists in withdrawing the same from the coating metal through a tube or narrow passage, and in preventing access of air, and the oxidation consequent thereon by causing the interior of the tube, or passage, to be filled with a gas or vapour, such as carbonic acid gas or steam. The wires, or wire chains, are wound on a reel as withdrawn, in the usual manner.

Another improvement consists in manufacturing tubes from black iron, and coating the same with zinc or other metal. The tubes are formed from uncoated sheet iron, the edges being seamed, and they are then plunged in a bath of molten zinc, by which they will be coated, and, at the same time, have the junction of their edges effected.

Another improvement consists in forming grooves or indentations in the ends of eave and other gutters, by which they will be much strengthened, at the same time that the facility of uniting lengths of them together will be increased, the grooves or indentations on the ends of one length being made to fit into those on the ends of the next adjoining lengths.

Another improvement consists in producing a flute or flutes across the ends of plates of corrugated iron, in order to facilitate the formation of joints when several such plates are employed for covering roofs and other similar purposes.

The last improvement consists in fixing or employing a fan or blower in the flue of a furnace employed for melting metals for coating purposes, at a point after or behind the fire, in order to draw away the smoke and products of combustion.

ARTHUR WELLINGTON CALLEN, of Peckham, gentleman, and JOHN ONIONS, of Southwark, engineer and iron-founder. *For improvements in the manufacture of certain parts of machinery used in paper-making, and certain parts of railways, railway and other carriages.* Patent dated February 14, 1852.

1. The patentees cast metallic bars and plates of machinery for pulping rags for the manufacture of paper, in malleable iron obtained from hæmatite ore; they also make the glossing and finishing rollers in the same manner.

2. They manufacture sleepers and chairs for railways from the same material, by casting in the manner usually adopted.

3. They cast all kinds of railway carriage bearings in the same metal, and case-harden those parts which are most exposed to wear.

Claims.—1. The casting of the metallic bars and plates used for pulping rags in the manufacture of paper, and also finishing and glossing rollers in malleable iron from the hæmatite ore.

2. The casting of railway chairs and

sleepers in malleable iron or hæmatite ore.

3. The casting of railway carriage bearings in malleable iron.

HERMANN TURCK, of Broad-street Buildings, merchant. *For improvements in the manufacture of resin oil.* (A communication.) Patent dated February 14, 1852.

Claims.—1. A a mode of treating resin for the extraction of oils therefrom.

2. A mode of manufacturing lubricating oil.

3. A mode of manufacturing tanners' or curriers' oil.

4. A mode of manufacturing paint-oil. (A full description of the above processes will be found at p. 110, vol. lvi.)

SAMUEL BANES, of Bethnal-green, master mariner. *For certain improvements in apparatus to be applied to or connected with the cables of ships or other vessels when riding at anchor.* Patent dated February 23, 1852.

Mr. Banes's improved apparatus consists of a hollow floating vessel, which is to be attached to a ship's cable at any point or points between the ship and the anchor. In certain cases the safety buoy is provided with an oil vessel, from which oil or greasy matter is emitted when the buoy is drawn under water by strain on the cable.

Claims.—1. A hollow vessel or vessels of whatever form preferred, of adequate strength and floating power, and provided with suitable apparatus for attaching or connecting the same to the cables of ships or vessels.

2. A hollow floating vessel or vessels capable of being attached to the cables of ships or vessels, combined with suitable apparatus for emitting oil or other greasy matter.

JAMES PILLING, of Rochdale, spinner and manufacturer. *For certain improvements in looms for weaving.* Patent dated February 23, 1852.

These improvements have relation to the "taking-up" motion, and consist,—

1. In dispensing with the emery roller, and connecting the take-up pin to a rod bearing on the surface of the cloth-beam in such a manner that, as the diameter of the cloth-beam is increased by the winding on of the cloth the leverage at which the taking-up pin works is proportionably varied, so as always to take up an equal quantity of cloth.

2. In moving the taking-up and holding-catches out of contact with the teeth of the cloth-beam ratchet-wheel whilst overrunning, so as to prevent the wear and tear of the same.

SAMUEL BOULTON, of Manchester, agent. *For improvements in the treatment of metallic ores, and certain salts and residuary matters, and in obtaining products therefrom.* Patent dated February 23, 1852.

Claims.—1. The manufacturing of zinc and its oxide, and also chloride of zinc from sulphate of zinc (by dissolving the same in conjunction with a substance containing chlorine).

2. The manufacture of zinc and its oxide from chloride of zinc obtained by sublimation. (In conducting this manufacture, ores of zinc are calcined with a substance containing chlorine.)

3. The manufacture of potash and soda, or their carbonates, when carbonate of zinc is used.

4. The decomposition of sulphate of soda and sulphate of potash by the application of hydrogen gas alone, or by the application of any gas containing hydrogen.

5. The manufacture of sulphur or sulphuric acid by operating on sulphates or sulphides, or any residuary matters containing sulphur (by calcination and the application of steam or hydrogen gas).

Old Lace.—Mr. Weed, an American writer, in one of his letters from Europe, gives the following notice of the mania for fine lace, which is conspicuous among the forms of modern extravagance:—"The ladies visited the principal lace-manufactory, where the Brussels article is made and sold for sums of money that would frighten people. What do you think for example, of trimming a dress with lace of 250 dollars and 300 dols. a yard? But just now the rage is for old lace. In Florence, Rome, Naples, Venice, &c., traffic in old lace is very active. Ladies look for it with more solicitude than for any other article of dress. Neither jewellery or precious stones are so much prized as lace known to have been worn by a cardinal or monk a century or two ago. No lady thinks of leaving Italy without securing some of these precious spoils. Of course the supply of old lace keeps pace with the rapidly-increasing demand. How much of it is genuine I will not undertake to say. Every lady is quite sure she can detect the antique from the modern."

WEEKLY LIST OF NEW ENGLISH PATENTS.

Henry Needham Scrope Shrapnel, of Gosport, for improvements in ordnance and fire-arms, cartridges, and ammunition or projectiles, and the mode of making up or preparing the same. August 23; six months.

Frederick Dam, of Brussels, chemist, for improvements in preventing incrustation in boilers. August 23; six months.

Josiah George Jennings, of Gt. Charlotte-street, Blackfriars road, brass-founder, for improvements in water closets, in traps and valves, and in pumps. August 23; six months.

Julius Roberts, of Portsmouth, lieutenant in the Royal Marine Artillery, for improvements in the mariners' compass. August 23; six months.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in the machinery and apparatus for printing fabrics and other surfaces. (Being a communication.) August 26; six months.

Paul Joseph Poggioli, of Paris, France, gentleman, for an improved medical compound. August 26; six months.

George Twigg, of Birmingham, button manufacturer, for certain improvements in the manu-

facture of buttons and other dress-fastenings, and in the machinery and apparatus to be used therein. August 26; six months.

Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex, for improvements in the application of iron to building purposes. (Being a communication.) August 26; six months.

John Fish, of Oswaldtwistle, Lancaster, for certain improvements in looms for weaving. August 26; six months.

Andrew Crosse, of Broomfield, Somerset, Esq., for improvements in the extraction of metals from their ores. August 26; six months.

Pierre Amable de Saint Simon Sicard, chemist, of Paris, for improvements in enabling persons to remain under water and in noxious vapours. August 26; six months.

James Lawrence, of Colnbrook, Middlesex, brewer, for improvements in brewing apparatus. August 26; six months.

LIST OF SCOTCH PATENTS FROM THE 22ND OF JULY TO THE 22ND OF AUGUST, 1852.

Joseph Haythorne Reed (late of the 17th Lancers), of the Harrow-road, Middlesex, gentleman, for improvements in saddlery and harness. August 2; six months.

William Edward Newton, of Chancery-lane, Middlesex, civil engineer, for improvements in the construction of wheels for carriages. (Communication). August 3; six months.

John Gerald Potter, of Over Darwen, Lancaster, carpet manufacturer, and Mathew Smith, of the same place, manager, for certain improvements in the manufacture of carpets, rugs, and other similar fabrics. August 6; six months.

Ralph Errington Ridley, of Hexham, Northumberland, tanner, for improvements in cutting and reaping machines. August 6; six months.

William Ackroyd, of Berkenshaw, near Leeds, for improvements in the manufacture of yarn and fabrics, when cotton, wool, and silk are employed. August 6; six months.

Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman, for improvements in the manufacture of metallic fences, which improvements are also applicable to the manufacture of verandahs, to truss frames for bridges, and to other analogous manufactures. (Communication.) August 13; six months.

Robert Hardman, of Bolton-le-Moors, Lancaster, mechanic, for improvements in looms for weaving. August 18; six months.

LIST OF IRISH PATENTS FROM THE 18TH OF JULY TO THE 18TH OF AUGUST, 1852.

Robert John Smyth, of Islington, Middlesex, for certain improvements in machinery or apparatus for steering ships and other vessels. July 19.

Frederick Sang, of Pall-Mall, Middlesex, artist in fresco, for certain improvements in machinery or apparatus for cutting, sawing, grinding, and polishing. July 19.

Richard Archibald Brooman, of the firm of J. C. Robertson and Company, of 166, Fleet-street, in the city of London, patent agents, for improvements in the purification and decoloration of oils, and in the apparatus employed therein. (Communication.) July 19.

Richard Parris of Long-Acre, Middlesex, modeller, for improvements in machinery or apparatus for cutting and shaping cork. July 22.

Joseph Maudslay, of the firm of Maudslay, Sons, and Field, of Lambeth, Surrey, engineers, for improvements in steam engines, which are also applicable wholly, or in part, to pumps and other motive machines. July 22.

Charles Augustus Preller, of Abchurch-lane, London, gentleman, for improvements in the preparation and preservation of skins and animal and vegetable substances. July 22.

James Joseph Brunet, of the Canal Iron-Works, Poplar, Middlesex, engineer, for certain improved combinations of materials in ship building. (Communication from Lucien Armaud, of Bordeaux, France.) August 5.

Henry Graham William Wagstaff, of Bethnal-green, Middlesex, candlemaker, for improvements in the manufacture of candles. August 5.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Aug. 19	3353	J. Newman	Soho-square	Colour box.
21	3354	S. S. Phillips	Chelmsford	Hot-water stove.
24	3355	T. Gibson, jun.	Manchester	Shirt front.
26	3356	F. G. Yates	Winksworth's-buildings	Lever knife.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Aug. 25	458	J. V. N. Bazalgette	Devonshire-street	Brickmakers' rotary moulding table.
26	459	J. Cooper	Birmingham	Joiners' brace.

CONTENTS OF THIS NUMBER.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1517.] SATURDAY, SEPTEMBER 4, 1852. [Price 3*d*., Stamped 4*d*.

Edited by J. C. Robertson, 166, Fleet-street.

STENSON'S PATENT STEAM BOILERS.

Fig. 4.

Fig. 5.

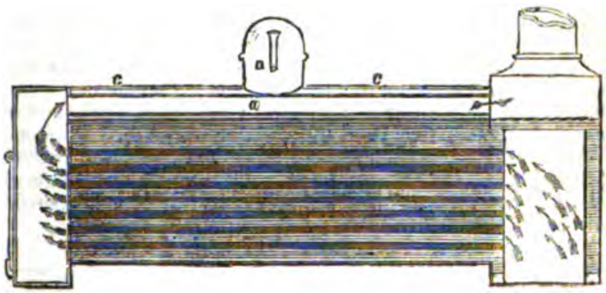


Fig. 6.

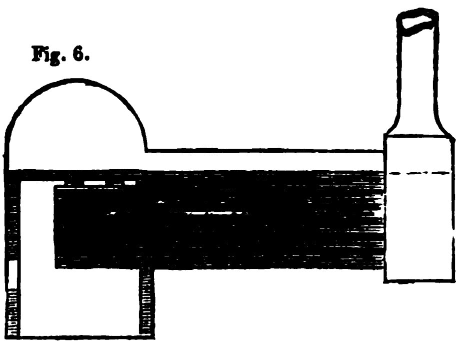


Fig. 7.

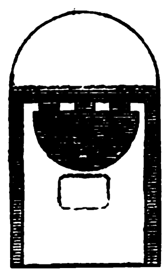


Fig. 8.

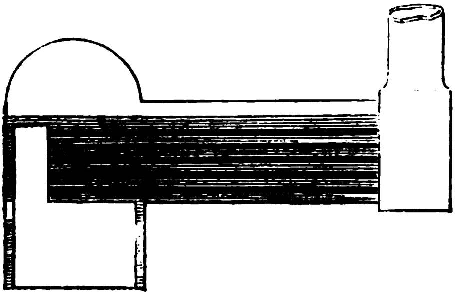
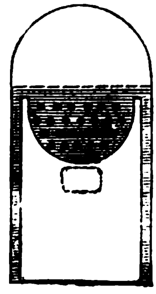


Fig. 9.



STENSON'S PATENT STEAM BOILERS.

(Patent dated December 27, 1851. Specification enrolled June 27, 1852. See *ante*, p. 35.)

Specification.

My invention relates to certain apparatus for the generation of steam, as hereinafter described. An auxiliary or furnace boiler may be constructed in the interior of any reverberatory furnace, connected with the boiler attached to the engine by which the motive machinery of ironworks is usually worked. My method of constructing and using such auxiliary boiler is as follows:—I construct in the interior of a reverberatory furnace a boiler of the same form in its interior as the inside of the fireplace of such furnace. The outer case of the boiler may be of any convenient shape; but I should prefer it of a form somewhat similar to the interior case of the same boiler, but of larger dimensions, so as to leave a water-space on all sides and at the top, except on that side towards the bridge or throat of the furnace, on which side there must be an opening corresponding to the aperture along which the flame is made to pass over the bridge of the furnace. There must also be openings through the side of such boiler corresponding to the holes now in use for the supply of fuel and for the heating of staffs. All the openings before mentioned to be made watertight according to the ordinary methods. The fire surface of this auxiliary boiler is lined with fire-brick, so as to prevent the auxiliary boiler absorbing too much of the heat necessary for well working the iron, either in puddling or other operations. I connect this boiler by means of pipes with such large steam boilers as may be used for the impelling of the motive machinery employed in the works. One of these pipes is connected from the top of the auxiliary or furnace boiler just described with the upper part (but below the water-line) of such large steam boiler, and the other pipe is connected from the bottom, or near the bottom, of such furnace boiler with the lower part of the said large steam boiler. The top pipe is fixed so that it may rise a little between its connection on the top of the furnace boiler towards its junction with the large one, thus completing the circulation of the water therein contained. The top pipe I call the flow-pipe, and the bottom one the return-pipe. This boiler is shown in plan in fig. 1, and in elevation in fig. 2. Another auxiliary boiler or steam generator may also be placed in the neck or outlet duct of the puddling or other furnace; which auxiliary boiler or steam generator I make of a form suitable to the neck or throat of such furnace, but leaving an opening on one side of such auxiliary boiler or steam generator, for the purpose of getting off the cinder which runs from the bottom of the furnace—this opening to be secured in the manner before stated. This auxiliary boiler I also connect by pipes in a way similar to that adopted in the connecting-pipes of the furnace boiler before described as being fixed in the fireplace of furnaces. This boiler is shown at fig. 3. The object of both these auxiliary boilers is to gain a greater supply of steam by the same expenditure of fuel as is required for the proper heating of the reverberatory furnace with which such auxiliary boilers are connected in manner before mentioned.

Another construction of steam generator or boiler is represented in figs. 4 and 5, applicable for various purposes. The objects specially aimed at in this boiler are; first, a much larger flue surface, for the more equable and economical application of the heat; and secondly, the reduction of the friction of air or products of combustion passing through the tubes. The arrangement I propose admits of enlarging the blast-pipe, reduces the velocity of draught, and, by means of return-tubes through an extra steam chamber, ensures the drying of the steam. In fig. 4 are represented three tubes marked *a*, *a*, *a*, the aggregate area of which should not be less than that of the chimney. C is the steam chamber, which should be strong, and will supply a long-acknowledged desideratum; namely, a boiler oval in point of form, without any diminution in the width of the water-line or the depth of water above the tubes, while the increase of weight would be but little additional to that of the boilers now in use. A steam dome would be desirable at D, from some point near the top of which the steam pipe should receive its supply for the cylinders. Holes perforated through the upper surface of the boiler would carry off the steam as generated by the tubes, and give facility to a free circulation of the water generally.

Fig. 1.

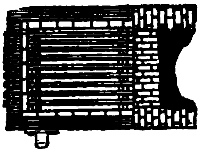


Fig. 2.

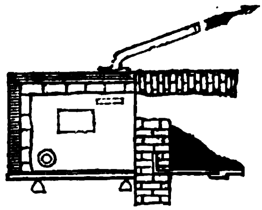
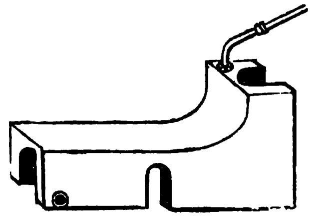


Fig. 3.



Another arrangement for increasing the generation of steam is shown in longitudinal section, fig. 6, and in transverse section, fig. 7, and a modification of the same in longitudinal section, fig. 8, and transverse section, fig. 9, in which the tubes are made to project, as shown, into the body of the fire-box, and a great increase of heating surface thereby obtained, thus securing an additional length in the tubes without adding to the length of the boiler.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—When my solution of the *Exciseman's Staff Question* was first communicated by my friend Mr. Wilkinson, for insertion in your widely-circulated Journal, I had no idea that it would ever have attracted so much attention. I am glad, however, that it has been the means of eliciting the elegant and general investigation of "Workman" contained in No. 1514. Since the final result of "Workman," for the particular case of the cylinder does not agree with mine a page 345, No. 1499, I have been induced to reconsider my own investigation The equation

$$(1)+(2) = \frac{l}{2} \cos.\beta \, . \, W,$$

should be

$$(1)+(2) = \left(\frac{l}{2} \cos.\beta + a \sin.\beta\right) W;$$

which gives

$$W = a^2 \pi D \frac{(l-m)\,(l+m+2a \tan.\beta) - \frac{a^2}{2}\left(\frac{1}{2}\cot.^2\beta+1\right)}{l+2a \tan.\beta.}$$

The numerical value of W appended to my solution seems to be erroneous. The equation

$$k = m \sin.\beta - a \cos.\beta,$$

or in numbers,

$$3 = 13 \sin.\beta - \tfrac{3}{4} \cos.\beta,$$

furnishes two *positive* values of sin. β, and it appears that I have taken the wrong one. The error may be avoided as follows: Dividing by cos. β, we have

$$k \sec.\beta = m \tan.\beta - a,$$

or

$$k^2 (1+\tan.^2\beta) = m^2 \tan.^2\beta - 2am \tan.\beta + a^2;$$

from which we find

$$\tan.\beta = \frac{am + k\sqrt{a^2+m^2-k^2}}{m^2-k^2} = ,1095604.$$

$$\therefore \cot.\beta = 9{\cdot}1273854.$$

These values of tan. β, cot. β make $W=8{\cdot}17528$. The above expression for W does not seem to be identical with "Workman's" final equation (15). Its correctness may be verified as follows: Referring to page 125, we have the equation,

$$W=\frac{PN}{PM}.F;$$

in which

$$PN=\frac{l}{2}\cos.\beta+a\sin.\beta+\frac{m}{2}\cos.\beta-\frac{a^2}{4}\cos.\beta\ \frac{\frac{1}{2}\cot.^2\beta+1}{l-m},$$

$$PM=\frac{l}{2}\cos.\beta+a\sin.\beta,$$

$$F=a^2\pi D\,(l-m),$$

Substituting these, we obtain the preceding expression.

I remain, yours, &c.,

SEPTIMUS TEBAY.

Preston, August 23, 1852.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—Three solutions of the Problem of the Exciseman's Staff having appeared in your Magazine, all, I believe, somewhat incorrect, I am induced to trouble you with a fourth. If I point out the errors of my predecessors, it is in no spirit of censoriousness, but to contribute as far as in me lies to the final settlement of this *vexata quæstio.*

Mr. Tebay's solution (No. 1499, page 345) seems to me erroneous by reason of some errors which have crept into the calculation, leaving it doubtful about what point he takes the moments, and omitting a term in the moment of W. One, at least, of his expressions by no means follows from the preceding steps, which may have resulted from inadvertence; but this is very bewildering to many who wish to master the solution. It is on this account that I have appended a correct solution on the principle of taking the moments of the whole fluid pressure.

Mr. Smith (No. 1504, p. 404) errs in taking the centre of gravity of displacement in the *axis* of the staff where it cannot be, unless the staff float with the axis vertical; and, 1, by adding a force $+$ F in equation (3) to a *moment* of force W.PM, to which Mr. Tebay justly objects. Mr. Tebay's remarks on the identity of the problem in question with the same problem when the staff is loosely connected to the side of the vessel by a hinge, are not, I believe, correct. The equation of moments is the same in both cases; but β is no longer known, but must be determined from this equation which also contains the unknown quantity m; the problem is therefore indeterminate, unless the depth of the surface of the fluid below A, the hinge be given; and thus another equation between the unknown quantities m and β be given. After these are found, the pressure on the hinge can be obtained immediately. Putting X = the resolved part of this pressure along the staff, and Y the resolved part at right angles to it, we have

$$\left.\begin{array}{l}X+W\sin.\beta-\mu V\sin.\beta=0\\ Y+W\cos.\beta-\mu V.\cos.\beta=0\end{array}\right\}$$

where V is the volume and μ the specific gravity of the displaced fluid; whence it appears that $\frac{x}{y}$ = tangent of angle, which the pressure on the hinge makes with the end of the staff, still = tan. β.

"Workman" (No. 1514, p. 124—126) errs in taking the pressure on the staff *vertical;* that is, in the direction of the side of the vessel, instead of perpendicular to the staff.

If R is the *normal* pressure, and therefore (using his notation) μR the friction, the vertical pressure = R sin. $\beta+\mu$R cos. β, the ratio of which to the normal pressure is sin. $\beta+\mu$ cos. β : 1, instead of ·1 : sin. β as he takes it.

He rightly observes, that the solution of the problem is incapable of both a *superior* and *inferior* limit; as our investigation, which we now subjoin, also shows.

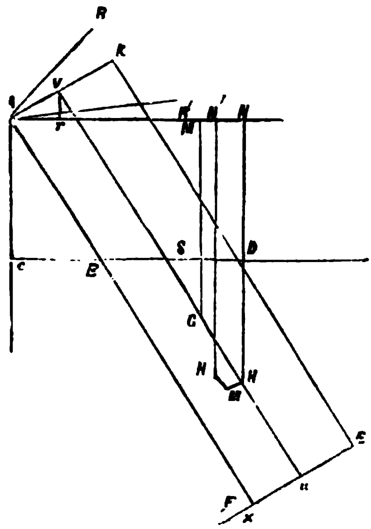
I am, &c.,

INDAGATOR.

August 23, 1852.

Solution.

A F E K a section of the staff by a vertical plane through the axis V S U.



Let radius of base of staff $=a$, $l=$ length of axis, $m=$ length of that portion *not* immersed, $\mu=$ specific gravity of the fluid, A C $=h$ the depth of surface of the fluid below A, $\angle$ A B C $=\beta$, D E $=b$. Let $\alpha=$ limiting angle of resistance between the staff and support at A, draw A R, A R′ making an angle α one above and the other below A K; then A R is the direction of the pressure at A when the staff is on the point of slipping downwards; and A R′ when it is on the point of slipping *upwards*. Through A draw the horizontal line A M N G: the middle point of V S U the centre of gravity of staff. H the middle point of $s\,u$; H′ the centre of gravity of volume immersed B F E D: G M, H N, and H′ N′ perpendiculars on A M N, and let W = weight of staff, V = volume displaced, the weight of which is equal to the resultant vertical pressure of the fluid upwards. Draw V r perpendicular on A N.

1. Let the staff be in a state bordering on motion by *slipping* downwards. Let P be pressure at A in direction AR. Then resolving all the forces *parallel* and perpendicular to AF, we have

$$\left.\begin{aligned}-\text{R sin.}\,\alpha + (\text{W}-\mu\,\text{V})\text{ sin.}\,\beta=0\\ \text{R cos.}\,\alpha - (\text{W}-\mu\,\text{V})\text{ cos.}\,\beta=0\end{aligned}\right\}$$

Whence, eliminating R

$$\text{tan.}\,\beta=\text{tan.}\,\alpha\ \ldots\ldots\ldots(1),$$

$$\text{or } \beta=\alpha \text{ or } 180^\circ+\alpha$$

the former of these gives the angle ABC = KAR, and is the common case; the second gives the outward

$$\text{CBF}=180^\circ+\text{FBD}=180^\circ+\text{KAR},$$

which is evidently the same case as the other.

2. Let it be in the state bordering on motion by slipping upwards. AR′ is now the direction of the pressure, and proceeding as before,

$$-\text{R sin.}\,\alpha+(\text{W}-\mu\,\text{V})\text{ sin.}\,\beta=0,$$

and $\quad \text{R cos.}\,\alpha-(\text{W}-\mu\,\text{V})\text{ cos.}\,\beta)=0,$

or $\quad \text{tan.}\,\beta=-\text{tan.}\,\alpha,$

this gives $\quad \beta=-\alpha \text{ or } 90^\circ+\alpha.$

The former value requires A to be below BC, or the end AK to be immersed, which is contrary to the conditions of the problem. The second value

$$\beta=90^\circ+\alpha,$$

makes

$\angle$ CBA greater than a right angle,

and $\therefore$ A cannot rest on the side at all. Hence there is no case of equilibrium where the staff is on the point of sliding upwards, except in the particular case of $\alpha=0$, which gives a vertical position of the staff, and $\text{W}=\mu\text{V}$.

Returning to the first case, therefore, we have

$$\text{tan.}\,\beta=\text{tan.}\,\alpha\ldots\ldots(1),$$

and forming the equation of moments about A, we have

$$\text{W.AM}=\mu\text{VAN}'=\mu\text{V}(\text{AN}-\text{AN}')\ldots\ldots(2),$$

and $\quad \text{AM}=\text{A}r+r\text{M}$

$$=a\text{ sin.}\,\beta+\frac{l}{2}\text{ cos.}\beta\ldots\ldots(3),$$

$$\text{AN}=\text{A}r+r\text{M}=a\text{ sin.}\,\beta+(l-\tfrac{1}{2}(l-m))\text{ cos.}\,\beta,$$

$$=a\text{ sin.}\,\beta+\tfrac{1}{2}(l+m)\text{ cos.}\,\beta\ldots\ldots(4),$$

and it remains to find the value of

$$\mu\text{V and }\mu\text{V.NN}'.$$

Take the base FE of the cylinder for the plane of xy, the centre of base U for origin, and UFX for axis of x, and the axis of staff for axis of z; then the value V(BFED) is that contained between the surface of the cylinder, the base and the plane BD which cuts it making angle $90°-\beta$ with the base.

Hence the equation to the cylinder is

$$x^2+y^2=a^2 \dots\dots\dots\dots (5),$$

and the cutting plane

$$z-b=(a+x)\cot.\beta \dots\dots (6),$$

and an element of the volume

$$=z\,dy\,dx,$$

its moment about plane of

$$yz=x\,2\,dy\,dx,$$

its moment about plane of

$$xy=\tfrac{1}{2}z^2\,dy\,dx.$$

Hence

$$V=\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=+a}(b+a\cot.\beta+x\cot.\beta)\,dx\,dy,$$

$$=\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=+a}(l-m+2\cot.\beta)\,dy\,dx,$$

$$=2\int_{-a}^{a}(l-m+x\cot.\beta)\sqrt{a^2-x^2}$$

$$=\pi a^2(l-m)=\text{vol. cylinder axis SU} \dots\dots\dots (7).$$

Again; if $\overline{x}$ and $\overline{z}$ be co-ordinates of centre of gravity H′.

$$V.\overline{x}=\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=+a}x(l-m+x\cot.\beta)\,dy\,dx,$$

$$=\frac{\pi a^4}{4}\cot.\beta=V.Hm \dots\dots (8),$$

$$V\overline{z}=\tfrac{1}{2}\int_{y=-\sqrt{a^2-x^2}}^{y=+\sqrt{a^2-x^2}}\int_{x=-a}^{x=-a}(l-m+x\cot.\beta)^2\,dy\,dx,$$

$$=\pi a^2\frac{(l-m)^2}{2}+\frac{\pi a^4}{8}\cot.^2\beta.$$

Now $$\pi a^2\frac{(l-m)^2}{2}=V.UH \text{ evidently},$$

$$\therefore\quad V.mH'=\frac{\pi a^4}{8}\cot.^2\beta \dots\dots\dots (9);$$

$$\text{but } V.NN'=V.\{Hm\sin.\beta+mH'\cos.\beta),$$

$$=\frac{\pi a^4}{4}\cos.\beta+\frac{\pi a^4}{8}\cos.\beta.\cot.^2\beta,$$

$$=\frac{\pi a^4}{4}\cos.\beta\left\{1+\tfrac{1}{2}\cot.^2\beta\right) \dots\dots\dots\dots (10).$$

$$\text{whence } \mu\,V.AN'=\mu\,\pi a^2(l-m)(a\sin\beta+\tfrac{1}{2}(l+m)\cos.\beta),$$

$$-\mu\frac{\pi a^4}{4}\cos.\beta\,(1+\tfrac{1}{2}\cot.^2\beta);$$

and the equation of moments becomes

$$W(a\sin.\beta+\frac{l}{2}\cos.\beta)-\mu\,\pi a^2(l-m)(a\sin.\beta\;\tfrac{1}{2}\,\overline{l+m}\cos.\beta)$$

$$+\mu\,\frac{\pi a^4}{4}\cos.\beta\,(1+\tfrac{1}{4}\cot.^2\beta)=0;$$

$$\text{or } W\left(a+\frac{l}{2}\cot.\beta\right)=\mu\,\pi\,a^2\left\{(l-m)(a+\tfrac{1}{2}(l+m)\cot.\beta)-\frac{a^2}{4}\cot.\beta\,(1+\tfrac{1}{4}\cot.^2\beta)\right\} \quad \ldots\ldots(11),$$

$$\text{Also } h=m\sin.\beta-a\cos.\beta\ldots\ldots\ldots(12).$$

m may be obtained by solving the quadratic in (11), and then h is given by (12).

This problem has been solved on the supposition that the staff is in the state bordering on motion; but the equilibrium is still possible for lower amounts of friction—that is, for smaller values of a, and consequently of β: the least value of which a is capable is zero, which gives the staff horizontal. The equation (11) becomes, under these circumstances,

$$(W-\mu\pi a^2\,(l-m))\,a=0,$$

or

$$W=\mu\pi a^2\,(l-m);$$

that is, the weight of the staff equals the weight of the fluid displaced, which it should be; and the weight of staff is capable of all values between this value and that obtained by putting β=the *limiting* angle of resistance. Unless, therefore, it be known that the staff be in the state bordering on motion, the problem is *indeterminate*, as Mr. Smith rightly observes. If, however, m is given, and also b, then β is found by 12, and therefore W can be completely found by (11). If the angle β could be observed, since it must always be equal to a, which depends on the amount of friction, the problem is fully determinable.

Mr. Tebay's solution (if the moments were all taken about A, which they are not) ought to agree with the above. It does not, however, on account of some errors which have crept into the calculation. The true solution, according to his method is as under:

Everything remaining as before, let x be any distance measured along the axis from U, and ϕ the $\angle$ which any radius makes with the radius in the vertical plane parallel to U F.

Then depth of any point in the horizontal chord $2a\sin.\phi$ of the immersed circular end $=b\sin.\beta+a\cos.\beta\,(1+\cos.\phi)$

$$=\sin\beta\,(b+a\cot.\beta+a\cot.\beta\cos.\phi),$$

$$=\sin.\beta\,(l-m+a\cot.\beta\cos.\phi),$$

and the pressure at this point

$$=\mu\sin.\beta\,(l-m+a\cot.\beta\cos.\phi),$$

and the element of the area whose length is chord $2a\sin.\phi$ and breadth $a\sin.\phi d\phi$

$$=2a^2\sin^2\phi d\phi;$$

the whole pressure on this chord

$$=2a^2\sin.\beta\sin.^2\phi\,(l-m+a\cot.\beta\cos.\phi)\,d\phi,$$

and acts through a point in the diameter EF whose distance from F

$$=a\,(1-\cos\phi)=2a\sin^2\frac{\phi}{2}.$$

Hence moment of the pressure on this chord from the lower end F.

$$=4a^3\sin\beta\sin^2\phi\sin^2\frac{\phi}{2}\,(l-m+a\cot\beta\cos\phi)\,d\phi.$$

Hence the whole moment, which is evidently the same as the moment of the same force about A

$$=4a^3\sin\beta\int_0^\pi\sin^2\phi\sin^2\frac{\phi}{2}\,(l-m+a\cot\beta\cos\phi)\,d\phi$$

$$=\pi a^3\sin\beta\,\left(l-m-\frac{a\cot\beta}{4}\right)\ldots\ldots\ldots(1).$$

Again; the depth of any point in the curved surface below the surface of the fluid at the end of the horizontal chord $2a\sin\phi$ of any circular section

$$=(l-m-x)\sin\beta+a\cos\beta\cos\phi$$

$$=\sin\beta\,(l-m+a\cot\beta\cos\phi-x)=\sin\beta\,(u-x).$$

Also an element of the surface

$$=a.d\phi.dx;$$

∴ Pressure on this element

$$= a \sin\beta\,(u - x)\,d\phi.dx\,;$$

and there is an equal pressure at the other end of the same horizontal chord, the resultant of which is a single pressure

$$2a \sin\beta \cos\phi\,(u - x)\,d\phi.dx,$$

acting parallel to FU: the perpendicular distance of this from end $A = l - x$.

Hence the moment of this pressure about A

$$= 2a \sin\beta \cos\phi\,(u - x)\,(l - x)\,d\phi.dx.$$

∴ moment of all such pressures which equals the moment of resultant pressure on the curved surface about

$$A = 2a \sin\beta \int_0^{\pi}\int_{x=0}^{x=u} \cos\phi\,(u - x)\,(l - x)\,d\phi.dx$$

$$= a \sin\beta \int_0^{\pi} \cos\phi\, u^2 \left(l - \frac{u}{3}\right) d\phi.dx$$

$$= \frac{a \sin\beta}{3} \int_0^{\pi} \cos\phi\,(l - m + a\cot\beta\cos\phi)^2$$

$$\times (2l + m) - a\cot\beta\cos\phi)\,d\phi$$

Expanding and performing the integrations which depend only on integrals of the form

$$\int_0^{\pi} (\cos\phi)^m\, a\phi$$

this

$$= \frac{\pi a^2}{2} \sin\beta\cot\beta \left\{ (l - m)\,(l + m) - \frac{1}{4}\,a^2 \cot^2\beta \right\}$$

$$= \frac{\pi a^2}{2} \cos\beta \left\{ (l - m)\,(l + m) - \frac{1}{4}\,a^2 \cot^2\beta \right\} \ldots\ldots (2)$$

But (1) + (2) = whole moment of the fluid d; pressure about A

$$= \mu\pi a^3\,(l - m)\sin\beta - \mu\frac{\pi a^4}{4}\cos\beta$$

$$+ \mu\frac{\pi a^2}{2}\,(l - m)\,(l + m)\cos\beta - \mu\,\frac{\pi a^4}{8}\cos\beta\cot^2\beta$$

$$= \mu\pi a^2\,(l - m)\sin\beta \left\{ a + \frac{1}{2}\,(l + m)\cot\beta \right\} - \mu\frac{\pi a^4}{4}\cos\beta \left(1 + \frac{1}{2}\cot^2\beta \right) \ldots (3)$$

but this equals the moment of the weight of the staff about end A

$$= W\left(a\sin\beta + \frac{l}{2}\cos\beta \right).$$

Hence equating and dividing by $\sin\beta$, we have

$$W\left(a + \frac{l}{2}\cot\beta \right) = \mu\pi a^2 (l - m) \left(a + \frac{1}{2}\,(l + m)\cot\beta \right)$$

$$- \mu\frac{\pi a^4}{4}\cot\beta \left(1 + \frac{1}{2}\cot^2\beta \right) \ldots (4),$$

which is the same as equation (11) in the first solution.

The remainder of the solution is the same as Mr. Tebay gives, and agrees with the first solution.

(*Supplementary Remarks to Solution.*)

Since forwarding the above solution of the "Exciseman's Staff Question," Mr. Smith's rejoinder to "Workman," in the last Number of the *Mechanics' Magazine*, has come under my notice. That gentleman, who is very liberal with his stric-

tures, would do well to make sure of his own mathematics—I much fear that his remarks on the mathematical attainments of the coterie of amiable gentlemen are not inapplicable to himself. His two former errors which have been repeateldy pointed out, and by "Workman," certainly, in a very indulgent manner, yet stand uncorrected; and I cannot see that he much improves his position by his rejoinder. He adopts "Workman's" error of supposing that part of the pressure, which is independent of the friction on the body, acts in the direction of the prop instead of in the direction of the normal to the surface, and makes this the basis of his reasoning. It seems that both he and "Workman" have to be taught, that if there be no friction, the pressure on the surface, in case of equilibrium, must be in the direction of the normal; otherwise there would be a resolved part along the tangent which must produce motion. The effect of friction is found by experiment to be the same as if this normal pressure remained the same, and an additional pressure acted in the direction of the tangent proportional to the normal pressure.

Mr. Smith's remarks on "rolling friction" are quite beside the question. The equation of moments provides against the motion of rolling, and this equation holds until the point P moves; that is, until the staff slides. Of course, in that case the staff will have a motion of rotation, because, otherwise, too much of it would be immersed in the fluid, and the fluid pressure exceed its due amount; but there would be no "rolling friction" called into play, because for this there must be a surface rolling on a surface, whereas the motion in this case would be that of a surface sliding on a point, or rather line of support; and the friction is the same whether the surface has also a motion of rotation or not.

I do not concern myself with the spirit in which this controversy has been carried on; but I quite sympathise with Mr. Smith in his remarks on the villanous habit so much in vogue among certain little cliques, of bespattering each other with the most fulsome expressions of praise when opportunity offers, in the hope, doubtless, that some of it, at least, will stick. Let every one have "a clear stage and no favour;" but away with such paltry attempts to earn a name, which, if deserved, is only soiled by so vile an artifice; and, if undeserved, is prejudicial to the interests of science.

I.

THE WANDSWORTH TELESCOPE.

[A correspondent of the *Times* furnishes the following rather copious statement of errors in the account of this stupendous structure which we published last week, *ante*, p. 175. ED. M. M.]

Sir,—I was sorry to read in your valuable paper of Monday last some mistakes respecting the gigantic telescope on Wandsworth-common. Your correspondent has given a fair statement about all concerned in this instrument, with but one exception, namely, your humble servant—who was the first to undertake to make this telescope, and the object-glass and all the optical work were contracted for and worked by me. If there is any merit in this great undertaking, let me have my share of publicity. The mistakes to which I allude in your correspondent's report are as follows:

1. Two glasses are used, one of flint and the other of plate-glass, either of which the observer may use at his option.

Such is not the case; and, for the better information to the public, I will explain how the two lenses are used.

The plate-glass lens has a positive focal length of 30 feet 1¼ inches; its refractive index is 1,5103. The flint glass lens has a negative focal length of 49 feet 10½ inches; and the refractive index of this glass is 1,6308. These two lenses, placed in contact, are used in combination, and constitute the achromatic object-glass, the focal length of which is 76 feet to parallel rays—that is, to all celestial objects, and it would be 85 feet focal length only to objects at about 700 feet distance from the object-glass.

The next mistake, and which is (no doubt) a typographical error, is, where it reports that double stars in the Great Bear have been separated 50° or 60° by this telescope, &c.! The largest eyepiece made for this instrument subtends to an angle of 30 minutes, its magnifying power is 125, and the diameter of the lenses 8 inches, which is about the size of the image of the full moon.

The next size eyepiece is 4 inches diameter, subtends to an angle of 15 minutes, and magnifies 250. The range of eyepieces then vary from angles of 9 minutes to 50 seconds, and the magnifying powers from 500 to 3,000. Therefore you will perceive that, with such eyepieces, double stars cannot be separated 50° or 60°. I have seen stars separated as many seconds.

These large eyepieces, with the rack-work motion, are not yet attached to the telescope

—smaller ones are being used only till the object-glass is properly adjusted.

I am, Sir, your obedient
Humble Servant,
THOMAS SLATER.

4, Somers-place West, near Euston-square,
August 24, 1852.

EXPERIMENTS ON ANCHORS—THIRD SERIES. SEE ANTE, P. 129.

Commodore the Hon. Montagu Stopford, the Chairman of the Committee of Management, stated to the gentlemen present, that the object of the *modus operandi* on this occasion was to test the canting of the anchors, their quickness in taking hold of, biting, and deepening into the ground, and also their holding powers at short-stay peak. Trotman's, the Admiralty (Sir W. Parker's), Lennox's, and Mitcheson's anchors were stationed on the port side; Aylen's, Rodgers's Exhibition prize anchor, Honiball's (Porter's), and Isaac's (American), on the starboard side of the *Royal Escape* lighter, being secured in a similar manner to that adopted on board ship. The ends of a 25-fathom length of 1⅛ inch chain cable were shackled on to the competing anchors port and starboard, with a large traversing iron block in the centre; this, again, was brought to a chain pendant over the horn or derrick of a dockyard lighter, and, with a fourfold purchase attached, brought to the capstan. At a signal from the gallant commodore, the lashings holding the first pair of competing anchors (Trotman's and Aylen's) were cut, and they dropped in 10 fathoms water. The heaving-in process commenced immediately, Trotman's bringing Aylen's home.

The next trial was between Lennox's and Isaac's (American) anchors, the former beating the latter considerably.

Lieutenant Rodgers's Exhibition prize anchor was then placed in competition with the new Admiralty anchor, constructed on the plan of Sir W. Parker, the former evincing a superiority over the latter. With this terminated the day's proceedings.

Second Day's Trial.—Saturday, August 21.

The experiments were resumed, commencing with the testing together of Honiball's (Porter's) and Mitcheson's. In this instance it was discovered that both anchors had fouled their stocks in dropping, and, as consequently no fair result could be arrived at, the Committee decided that another trial should take place between them.

Trotman's and Lennox's anchors having been placed in their respective positions to be tried against each other, they were hove upon, Trotman's bringing his adversary's home. The further proceedings were then adjourned until Tuesday, the 24th inst., in order that the successful anchors in the above trials might be placed in the manner requisite for competition, with the view of determining the best among them.

Third Day's Trial.—Tuesday, August 24.

Rodgers's Exhibition prize and Mitcheson and Son's anchors, having been previously dropped in their proper positions, were forthwith hove upon. At length Rodgers's came up, when it was discovered that it was fouled in the stock. A consultation was then holden, when it was determined that another trial should take place.

Returning to the lighter, the same two anchors were again let go. On the purchase being applied the strain appeared to be very great. After two hours' heaving in, Mitcheson's anchor brought Lieutenant Rodgers's home. Proceedings then adjourned until the following morning.

During the progress of this day's trials the following resolution of the Committee of Management was handed to the respective owners of anchors:—

"That as it is desirable the Report of the Committee should be accompanied by correct models of the competing anchors, so as to serve as records of the present state of anchor art, the owners of the several anchors be invited to furnish correct models, in gun-metal, on the scale of three-quarters of an inch to the foot."

Fourth Day's Trial.—Wednesday, Aug. 25.

The whole of this day was occupied with the testing together of Honiball's (Porter's) and Mitcheson's anchors, which resulted in the former being hove up first, after a most severe and protracted struggle. This brings Mitcheson's in competition with Trotman's (improved Porter's), on the completion of which the present series of trials will be brought to a close.

Fifth Day's Trial.—August 26.

The operations commenced this day with the trial of Trotman's and Mitcheson's anchors. Trotman's having been let go two days previously, its stock had become imbedded, whereby, it is supposed, its canting was prevented, and it came home first. Mitcheson's had been dropped on the morning of this day. The Committee, in consequence, decided that this was no trial, and ordered the anchors to be relaid for competition.

While this was going on, an interesting contest took place between Aylen's and Lennox's anchors, in which the former was victorious.

Sixth and Last Day's Trial.—August 27.

Trotman's and Mitcheson's anchors having been placed in their relative positions, Trotman's to port and Mitcheson's to starboard, the heaving-in process commenced, and ended in Trotman's being brought home, a result which (with the exception of one trial only of the present series) has occurred to all the anchors the lot of which it was to have a position to port.

The third series of experiments are thus brought to a most unsatisfactory close, such as will tend rather to confuse than assist the Committee in forming a just estimate of the relative merits of the competing anchors. In the trials which took place in the dockyard, and on the beach, Honiball's (Porter's) beat Mitcheson's; and Trotman's (improved Porter's) proved successful against both Honiball's and Mitcheson's. Some explanation is, therefore, necessary to render these conflicting results intelligible.

In recording the present trials, it must be observed that all the anchors placed on the port sides were beaten by those on the starboard, with the exception of the first pair tested together (Trotman's and Aylen's), in which instance Trotman's was successful. It fell to the lot of Mitcheson's to be placed on the extreme starboard, so that its competitor was necessarily dropped into ground broken up by the previous trials (10 in number), making 20 furrows within a quarter of a circle converging to a common centre, viz., the purchase on board a dockyard lump made fast by the stern to the moorings of a first-rate man-of-war.

The above adverse circumstances did not occur in the former series of trials, as the receding tide allowed the competing anchors to be placed in new and alternate positions, without the possibility of their getting into the furrows made by any previous trials.

The four best anchors, as proved by the three preceding trials, will be selected for testing at the Nore, on Friday, the 10th inst., when steam power will be employed, and their other qualifications besides holding properties, viz., quickness in taking the ground, holding on, bringing up short, fouling, sweeping, &c., will be thoroughly tried.

These important points being ascertained, the anchors will be taken to Woolwich to undergo hydraulic pressure as a proof of their relative strength.

THE TELEGRAPHIC LINES OF THE WORLD.

BY DR. L. TURNBULL.

(From the "Journal of the Franklin Institute" for July.)

United States.

In giving an account of the number of telegraphic lines, it will be proper to place the United States as first on the list, from the number and extent of the lines, and from the extensive use made of them in every department, both for business and pleasure. Still it will be but an approximation to the number, for they are like the spider's web, forming a complete network over the length and breadth of the land, from the extreme north-eastern point to the western boundary of Missouri, adjoining the Indian territory. A continuous line of telegraph now extends from the verge of civilization on the western frontier (east of the Rocky Mountains) to the north-eastern extremity of the United States; and the time is not far distant when we shall have a telegraph from the Mississippi river to San Francisco. This is no fancy sketch, as the route is already selected for the California line, and a most interesting Report was presented to the Senate of the United States in the Session of 1851, by the Committee on Post-offices and Post-roads.

"The route selected by the Committee is, according to the survey of Captain W. W. Chapman, U. S. Army, one of the best that could be adopted, possessing as it does great local advantages. It will commence at the City of Natchez, in the State of Mississippi, running through a well-settled portion of Northern Texas, to the town of El Paso, on the Rio Grande, in latitude 32°; thence to the junction of the Gila and Colorado rivers, crossing at the head of the Gulf of California to San Diego, on the Pacific; thence along the coast to Monterey and San Francisco. By this route, the whole line between the Mississippi River and Pacific Ocean will be south of latitude 33°; consequently, almost entirely free from the great difficulties to be encountered, owing to the snow and ice on the northern route, by the way of the South Pass, crossing the Sierra Nevada Mountains in latitude 39°. The whole distance from the Mississippi to San Francisco will be about 2,400 miles."

The great benefits to be derived the Report fully and ably sets forth, whether in a military, commercial, or social point of view.

"In a commercial point of view, the line in question assumes a gigantic importance, and presents itself not only in the attitude of a means of communication between the opposite extremes of a single country, how-

ever great, but as a channel for imparting knowledge between distant parts of the earth. With the existing facilities, it requires months to convey information from the sunny climes of the East to the less favoured, in point of climate, but not less important regions of the West, teeming as they do with the products of art and enterprise. Let this line of wires be established, and the Pacific and Atlantic Oceans become as one, and intelligence will be conveyed from London to India in a shorter time than was required ten years since to transmit a letter from New York to Liverpool.

"Nor does the importance of the undertaking claim less interest, when regarded in a social point of view. California is being peopled daily and hourly by our friends, our kindred, and our political brethren. The little bands that a few centuries since landed on the western shores of the Atlantic, have now become a mighty nation. The tide of population has been rolling onward, increasing as it approached the setting sun, until at length our people look abroad upon the Pacific, and have their homes almost within sight of the spice groves of Japan. Although separated from us by thousands of miles of distance, they will be again restored to us in feeling, and still present to our affections, through the help of this noiseless tenant of the wilderness."

In the *Congressional Globe* of April 6, 1852, Mr. Douglass presented the memorial of Henry O'Reilly, proposing a system of intercommunication by mail and telegraph, between the Atlantic and Pacific States. All he asks is permission to establish a telegraphic line from the Mississippi Valley, where the wires now terminate, to the Pacific Ocean, and to be protected by a line of military posts, so that he can keep up the communication for the benefit both of the Government and of the public. Mr. O'Reilly states in this memorial, that within two years from this time, with this line completed, he would be able to deliver the European news on the shores of the Pacific within one week from the time it left the European Continent. The motion was referred to the Committee on Territories.

These are but a part of the advantages set forth in the Bill, with a strong recommendation from the Committee for its passage.

The authorities of Newfoundland have granted to Mr. H. B. Tibbatts and associates, of New York, the exclusive right to construct and use the magnetic telegraph across that island for the period of thirty years. The grant is designed to facilitate Mr. Tibbatts in his scheme for the establishment of steam and telegraphic communication between New York and Liverpool or London, *in five days*. The telegraph is to extend from New York to St. John's, from whence a line of steamers is to run to Galway, where another line of telegraph is to commence, extending to London. This latter line will, it is said, be completed during the current year. The distance from St. John's to Galway is 1647 miles, or about five days' sail.

There are numerous lines in actual and successful operation under the title of Morse, House, and Bain, each giving every facility to the business man.

A recent letter from Charles T. Chester, Esq., telegraphic engineer, who is connected with the Morse Line, the first and most extensive one in the United States, gives the following statistics of the facilities for the transmission of intelligence along their lines in the chief cities of this country.

"Two Morse wires run to Boston, that to Buffalo, five to Philadelphia, four to Washington, and two on to New Orleans; on the Western and Canada routes there is generally but one."

The above list will give an approximation of the number of the Morse lines, obtained principally from Mr. Chester, and from the work of Disturnell, published January, 1852. The following is a list of the names of the Companies:

1. Washington and New Orleans Telegraph, organised under Morse's patent; tariff of charges, 2 dollars; from Washington to New Orleans, 1716 miles, with 19 stations: no charge for address, signature, or date; Daniel Griffin, Esq., President.

2. Atlantic and Ohio Telegraph Line; Philadelphia - office, 101, Chestnut - street; tariff of charges, 1 dollar 30 cents. to Milwaukie, Wisconsin; from Philadelphia to Milwaukie, 812 miles, with 76 stations.

3. The Magnetic Telegraph Company Line, extending from New York to Washington City; office, No. 5, Hanover-street, corner of Beaver-street, New York; rates of charges, 50 cents.; from New York to Washington, 245 miles, with 10 stations. Also, from New York to New Orleans, 2 dollars 50 cents.; but when a communication exceeds 100 words, the price on all words exceeding that number will be reduced one-third.

4. New York, Albany, and Buffalo Telegraph; office, No. 16, Wall-street, New York, up stairs; from New York to Niagara, 500 miles; 65 cents. This line connects with numerous towns and cities in Vermont, Canada, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Iowa, Tennessee, and Kentucky; with 76 stations.

5. Troy and Canada Telegraph; from Troy to Montreal, with 14 stations.

6. Magnetic Telegraph Line, from Boston to Halifax, N. S., with 12 stations.

7. New York and Boston Magnetic Telegraph Association, organized under Morse's patent; office, No. 5, Hanover-street, near Beaver-street, New York; from Boston, Mass., to Halifax, N. S.; with 35 stations. Also, from New York, *vià* Bridgeport, to Birmingham, Connecticut, with 11 stations; 50 cents for ten words.

The first American telegraphic line was established in May, 1844, between Washington and Baltimore, over a length of 40 miles.

The line from Washington to Baltimore also proceeds to Philadelphia and New York, over an extent of 250 miles. It reached Boston in 1845, and became the great line of the North, from which branched two others; one, the length of 1,000 miles, from Philadelphia to Harrisburgh, Lancaster, Pittsburg, Ohio, Columbus, Cincinnati, Louisville (Kentucky), and St. Louis, (Missouri); the other, the length of 1,300 miles, from New York to Albany, Troy, Utica, Rochester, Buffalo, Erie, Cleveland (Ohio), Chicago (Illinois), and Milwaukie (Wisconsin).

A fourth line goes from Buffalo to Lockport, Queenstown, the Lakes Ontario and Erie, the Cataracts of Niagara, Toronto, Kingston, Montreal, Quebec, Halifax, and the Atlantic Ocean, over an extent of 1,395

Two lines South; one from Columbus to New Orleans, by Cincinnati; the other from Washington to New Orleans, by Fredericksburg, Charleston, Savannah, and Mobile. The first is 1,200 miles long, the second 1,122. This line has been extended West to Independence, Missouri.

In April, 1852, direct communication was had between the New Orleans Telegraph office and the office of the New Orleans line in Hanover-street, New York, the whole extent of near 3,000 miles of wire having been successfully worked in a single circuit. Despatches were sent from New York to New Orleans 60 minutes ahead of time.

The House Printing Telegraph has only been in Operation since 1846, but even in that short time has spread itself over a large portion of the United States, working to the entire satisfaction of our business community, and wherever found, exciting the admiration of the curious, being able to print in Roman capitals communications in almost every language.

This line consists of the Boston and New York Telegraph Company, using the House Printing Telegraph; about 600 miles of wire, two wires; stations at Boston, Massachusetts; Providence, Rhode Island; Springfield, Massachusetts; Hartford, Connecticut; New Haven and New York.

A line will be constructed to connect with this Boston line, running from Springfield, Massachusetts, to Albany, New York; there to intersect the New York and Buffalo line, using the same instruments, extending from New York to Buffalo, a distance of 570 miles. One wire is now in operation, connecting with Poughkeepsie, Troy, Albany, Utica, Syracuse, Lyons, Rochester, Albion, Lockport, and Buffalo; and another wire, nearly completed the same distance. This line is to continue to St. Louis, Mobile, connecting with Cleveland, Cincinnati, Louisville, and St. Louis, which will be completed the entire distance in 1852; forming the longest line in the world, under the direction of one Company, the whole length being 1,500 miles.

The New Jersey Magnetic Telegraph Company, using the House instruments, and the first line of this kind ever put in operation, extends from Philadelphia to New York; one wire, 132 miles; and another now being put up, for this information, I am indebted to the politeness of William J. Phillips, Esq., Telegraphic Engineer on the House line at Philadelphia, making the whole number of miles 2,802; rate, 25 cents for the first ten words from Philadelphia to New York.

The Atlantic and Pacific Telegraph range, under the arrangement of Henry O'Reilly, Esq., using a modification of Bain's Chemical Telegraph and Morse's instrument, from New York to Washington, and from New York to Boston. Also, the first division, constructed eastward of the Mississippi, known as the "Atlantic, Lake, and Mississippi Telegraph," extending to the Atlantic, and connecting nearly all principal cities and towns between the Canadian frontier and the Mexican Gulf—embracing the Ohio and Mississippi valleys, as well as the Lake country; about 6,000 miles constructed, and 3,000 miles contracted for construction.

The second division, westward of the Mississippi, to include the "Mississippi and Pacific Telegraph," of which about 500 miles of river distance, embracing the principal towns along the Missouri, between St. Louis and Fort Leavenworth, is contracted for construction, additional to other extensions in different quarters, west of the Mississippi, to be extended from Fort Leavenworth to San Franscisco, when Congress authorizes the extension through the public domain.

The Bain Line, now a Morse Line, Mr. Henry Rodgers, General Superintendent from New York to Washington, has lately constructed, at an expense of 10,000 dollars, spars 310 feet high, at the Palisades and Fort Washington, ten miles above the city

of New York, for the purpose of sustaining their wires over the river, instead of the method formerly employed, by passing the current through the water, by wires laid across the North River. He considers this method, by means of suspension on spars, as being more permanent and durable. The price of telegraphic dispatches by this line is the same as the others. They have offices in Boston, Providence, New York, Philadelphia, Wilmington, Baltimore, and Washington.

The Bain lines in the United States are as follows:—

One from Louisville to Memphis, called an O'Reilly Line, and contemplate using the same instrument to New Orleans on the same line.

One from New York to Boston; two wires.

One from Boston to Portland, Maine.

And one from New York to Buffalo: two wires.

The profits to the stockholders amount to from three to six per cent. per annum. The usual expense of constructing these lines varies from 100 to 200 dollars per mile.

List of the Morse Telegraph Lines in the United States.

		Miles.
1.	Washington to New Orleans, by way of Richmond, Virginia	1,716
2.	Washington to New York, by way of Baltimore and Philadelphia, 5 lines, each 250 miles	1,250
3.	Harper's Ferry to Winchester, Virginia	32
4.	Baltimore, by way of Pittsburgh and Wheeling, to Cumberland	324
5.	Baltimore to Harrisburg, by way of York, Pensylvania	72
6.	York to Lancaster, by way of Columbia, Pensylvania	22
7.	Philadelphia to Lewistown, Delaware	12
8.	Philadelphia to New York, 6 lines, each 120 miles	720
9.	Philadelphia to Pittsburg, by way Harrisburg	309
10.	Philadelphia to Pottsville, by way of Reading	98
11.	Reading to Harrisburg	51
12.	New York to Boston, by way of New Haven, &c., 2 lines, each 240 miles	480
13.	New York to Buffalo, by way of Troy and Albany, 5 lines, each 500 miles	2,500
14.	New York to Fredonia, N. Y., by way of Lake Erie, Newburg, and Oswego	450
15.	Bridgeport, Connecticut, to Bennington, Vermont, by way of Pittsfield	150
16.	Boston to Newburyport, by way of Salem, Massachusetts	34
17.	Boston to Portland, by way of Dover	110
18.	Worcester to New Bedford, by way of Providence	97
19.	Worcester to New London, by way of Norwich	74
20.	Portland to Calais, Maine	260
21.	Calais to St. John's, New Brunswick	75
22.	Troy to Whitehall, by way of Salem	72
23.	Troy to Montreal, Canada, by way of Rutland and Burlington	278
24.	Syracuse to Oswego, New York	38
25.	Auburn to Elmira, by way of Ithaca, New York	75
26.	Binghampton to Ithaca, by way of Oswego, New York	48
27.	Buffalo to Queenstown, Canada, by way of Lockport	48
28.	Buffalo to Milwaukie, Wisconsin, by way of Lake Erie and Chicago, Illinois	812
29.	Queenstown to Montreal, by way of Toronto and Kingston	466
30.	Montreal to Quebec	180
31.	Cleveland to Pittsburgh, by way of Alton, Illinois	150
32.	Pittsburg to Cincinnati, Ohio, by way of Columbia	310
33.	Pittsburg to Columbia	680
34.	Columbia to Memphis, Tennessee, by way of Wheeling	205
35.	Columbia to New Orleans, by way of Tuscumbia and Natchez	638
36.	New Orleans to Balize, at the mouth of the Mississippi	90
37.	Columbia to Chilicothe, Ohio	45
38.	Cincinnati, Ohio, to Maysville, Kentucky, by way of Ripley	60
39.	Cincinnati to St. Louis, Mobile, by way of Vincennes	410
40.	St. Louis to Chicago, by way of Alton, Illinois	330
41.	Alton to Galena, by way of Quincy	380
42.	Quebec to Halifax	700
43.	St. Louis to Independence, Mobile	25
44.	New York to New Orleans	3,000
	Total	17,283

Making in all the lines—

House Line	2,802	miles.
O'Reilly Line, using in most of the offices the modified Bain instrument —part of the O'Reilly Line using the Morse instrument	6,000	„
Morse Line	17,283	„
Bain Line	1,092	„
Total number of miles in the United States	27,177	

(*To be continued.*)

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING SEPTEMBER 2, 1852.

WILLIAM STIRLING LACON, of Great Yarmouth, Norfolk, gentleman. *For improvements in the means of suspending ships' boats, and of lowering the same into the water.* Patent dated February 23, 1852.

The object of this invention is so to suspend ships' boats at the sides or the stern of a vessel, that in the case of any sudden emergency, as the conflagration or the foundering of a vessel, her boats may be readily lowered and put to sea, without the risk of the tackles, or other contrivances which connect the boats to the ship, retarding the operations of lowering and floating them clear of the ship.

The manner in which the patentee overcomes the difficulties hitherto attendant on the lowering of ships' boats during tempests, on dark nights, and at periods of excitement and danger, is by suspending the boats from chains or ropes, which pass over the davits of the ship, and thence down to a winch or windlass, round which they are wound, but are attached thereto, in such a manner that when the winch is free to revolve, the ropes or chains will unship or disengage themselves from their attachment by their own weight. By this means, he prevents the possibility of the ship, in its onward progress through a rough sea, dragging forward a lowered boat, and capsizing or swamping it; the weight of the chains or ropes, to say nothing of the resistance of the boat, being sufficient to disconnect them from the winch, and thereby render the boat free of the ship.

Fig. 1 represents, in side view, a boat suspended, according to these improvements,

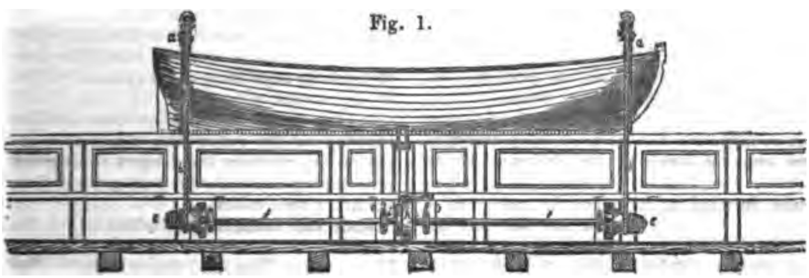


Fig. 1.

Fig. 2.

Fig. 4.

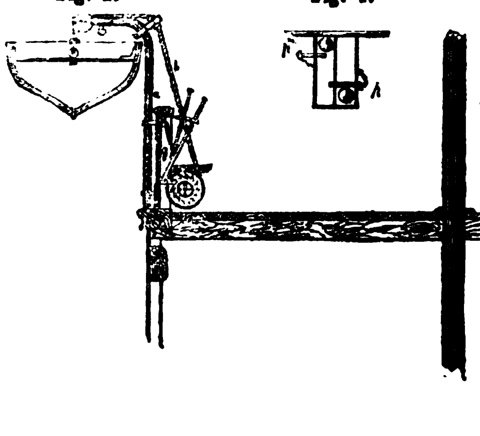
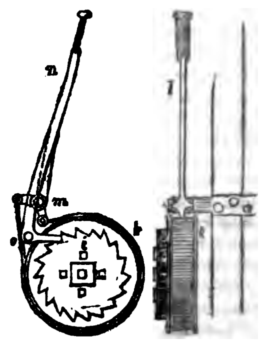


Fig. 3.



from the davits at the side of a ship, and also the apparatus employed for lowering the boat into the water, as fitted to the deck of a ship; and fig. 2 is a cross section of the same. In these figures *a a* are two davits or iron brackets, firmly secured to the bulwarks of the ship, and provided with sheaves or friction-pulleys, over which the ropes or chains *b b* for supporting the boat pass. The boat may be hoisted up at sea, if desirable, by means of the ordinary tackle; and when thus hoisted up, may be permanently retained in the desired position, by attaching the ropes or chains to the boat by the ordinary method in use.

The ropes or chains *b b* pass down from the davits to conical barrels *e e*, and are connected thereto by the last link in each chain, or an eye at the extremity of the rope, hooking on to a curved pin, projecting from the periphery of the barrel. These barrels are mounted on a shaft *f f*, which turns in bearings in the bracket-pieces *g g*.

The barrels *e e* are caused to rotate by the means hereafter described, for the purpose of tightening the suspending chains or ropes, and causing them to sustain the weight of the boat. The tackles, before mentioned as employed for hoisting up the boat, are then removed. At about the middle of its length, the shaft *f* carries a large friction-pulley *h h*, to which a ratchet-wheel *i i* is affixed. Around this pulley *h* a friction-strap *k k* is placed, and the ends of the strap are joined to a lever *l*, which works on a fulcrum pin *m* (see fig. 3). Into the teeth of the ratchet-wheel a catch, projecting from a lever *n*, which works on a pin *o*, takes for the purpose of preventing the running down of the chains or ropes *b b* by the rotation of the barrels, and is kept forward in its place by means of a spring *q*. The levers *l n* are set fast by means of the pins *p p** [(see fig. 4), which are readily withdrawn when the apparatus is to be brought into operation.

Let it now be understood that the boat, which has been raised to the position shown in the drawing, is required to be lowered into the water. The seaman to whom this duty is assigned, first pulls forward the lever *l*, in order to make the friction-strap *k* retain its hold of the friction-pulley *h*, and thus prevent the premature revolution of the shaft *f*. He then thrusts back the lever *n*, and releases the catch from the teeth of the ratchet-wheel *i*, the lever end being kept back by means of the pin *p**, as shown in fig. 5. On loosening the gripe of the friction-strap *k*, the boat will descend by its own gravity, and cause the chains or ropes to unwind from the barrels *e e*. When the boat has reached the water, the weight of the chains or ropes will, if the shaft *f* is still free to revolve, pull round the barrels, until by the slipping of the last link of each chain (or the eye at the extremity of the rope) from the projecting pin of its respective barrel, the ropes or chains fall away from the ship, and consequently free the boat of its connection with the ship. In order to prevent the boat from running down into the water too rapidly, it is only necessary for the seaman to keep the friction-trap in contact with the pulley *h*, by holding the lever *l* in its forward position, and thus any requisite amount of retardation may be put on the rotation of the barrels *ee*, and consequently on the descent of the suspending chains or ropes. If desirable, the shaft *f* may be furnished with a cog-wheel for the purpose of gearing into a pinion mounted on a short shaft provided with a winch handle, by turning which the boat may be hoisted up, or the winding of the suspending ropes or chains *b b* on to the barrels may be effected either when the ropes or chains are connected to or are free of the boat, or the ordinary hand-spike may be used to raise the boat to its elevated position instead of employing the tackles as at present.

Claims.—1. The suspending of ships' boats by chains or ropes, which are capable of disengaging themselves by their own weight from the ship when once the lowering of the boat is accomplished.

2. The employment of a friction pulley and friction strap, or other analogous contrivance for regulating the descent of ships' boats into the water.

3. The means hereinbefore described for running out the suspending chains or ropes uniformly, whereby the dangers consequent on lowering one end of a boat quicker than the other are avoided.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of 166, Fleet-street, London, patent agent. *For improvements in windmills.* (Being a communication.) Patent dated February 23, 1852.

This invention has relation to what ar known as "horizontal windmills," and consists of the improved method of construction represented in figs. 1, 2, and 3 of the engravings; fig. 1 being an elevation of the improved windmill complete; fig. 2 a horizontal section of the same; and fig. 3 a side view of the revolving parts of the mill. AA is a platform erected at a convenient height above the level of the ground. BB is an octagonal or other shaped windhouse which is raised on the platform A. The centre part of this windhouse is formed so as to allow the revolving part or parts of the mill to work within it. CC are partitions by which the wind blowing against

the sides of the windhouse is directed into the interior. The partitions are placed tangentially to the circumference of the revolving part of the mill, and the passage for the

Fig. 2.

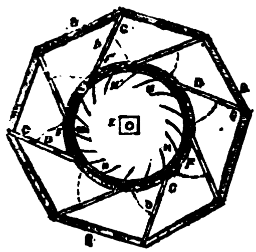


Fig. 3.

Fig. 1.

wind is gradually contracted from the point where it enters the windhouse to that at which it impinges on the vanes. DD are doors or flaps in the partitions CC, which serve to close the ends of the passages between the compartments, and prevent the wind from obtaining access to the interior of the mill when it is not required to be at work. E is the main shaft from which the motion is communicated to the grinding machinery, or other machinery to be driven. FF are circular frames or rings bolted to the arms GG, which radiate from the shaft E. HH are curved or flat vanes, or blades, which project inwards from the rings FF, by d between which they are supported. The number of these vanes may be varied, but should generally be about twice that of the ingress apertures formed by the partitions CC of the windhouse. The action of the windmill is as follows :—Three sides of the windhouse (supposing it to be, as usual, of an octagonal form) being always exposed to the prevailing winds, the wind is deflected by the partitions C C, through the passages between the said partitions to the interior of the mill, on entering which it strikes against the vanes or blades, H H, on their convex sides, and passing through between them, escapes on the opposite side, exerting during its escape, a considerable effect on the concave side of the blades HH, and thereby increasing the rapidity of the revolution of the moving parts. In order to direct a large volume of wind into the windmill, sails may be extended as continuations of the partitions CC from the windhouse in each direction. The power of the mill, or the rapidity of its revolution, will thus be considerably augmented. The proportions of the different parts of the mill may be varied indefinitely, as may also the number of partitions in the windhouse, and of vanes attached to the revolving part of the mill, which vanes may also be either straight or curved,—the latter form being, however, considered that which is best adapted for general purposes. The diameter of the revolving parts of the windmill should in no case exceed half that of the windhouse. When a windmill of this kind is employed on board ship, it will be better to dispense with the employment of the windhouse, which would only increase the cumbrousness of the apparatus without augmenting its efficiency. As the vanes on both sides of the revolving part are in operation at the same time, that is, part of the vanes being acted on by the wind on the exterior, and a corresponding number by the wind passing through the apparatus on the interior side, there will be no tendency to make the vessel incline to one side, and the equilibrium is further sustained by the centrifugal force of the blades during the revolution of the revolving part of the mill.

Claim.—The employment in windmills of a windhouse divided into partitions with doors or flaps therein, for the passage of the wind to the vanes in the manner represented in the drawings and hereinbefore described.

Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury. *For certain improvements in gas burners.* (Being a communication.) Patent dated February 23, 1852.

Claims.—1. The construction of gas burners divided into compartments, and provided with internal tubes for regulating the supply and combustion of gas.

2. The supplying of air to gas burners through orifices in the chimney, the said burners being covered with a metal cloth; and the adaptation of tubes in lieu of the ordinary apertures for the passage of the gas, by which joint arrangements the vacillation of the flame is avoided.

Thomas Walker, of Birmingham. *For*

improvements in steam engines. Patent dated February 23, 1852.

These improvements have relation to an improved construction of rotary engine, in which two cylinders, placed side by side, are employed, having cylindrical pistons revolving excentrically within them and in such relative positions on their respective shafts, that in all points of their revolution they touch constantly the ends of a slide working backwards and forwards in a recess formed in the metal between the two cylinders, which slide has suitable passages formed in it for the admission and egress of the steam into and from the cylinders, thus acting as a slide valve, and at the same time, forming the steam abutment. The slide is constructed of two wedge-shaped pieces having springs interposed, which maintain constantly a tendency to force the two parts from each other, and thus preserve steam contact between the ends of the slide and the revolving pistons, and compensate for wear. The cylinders have each one of their end covers formed in several pieces, to increase the facility of access for packing, &c., to the internal parts of the engine; and the pistons are attached to the shafts by being keyed to projections on the shafts at about the middle of their length. The motion of the two shafts is taken from them by means of wheel gearing.

Claims.—1. The mode of combining two cylindrical pistons fixed excentrically on their axes in two steam cylinders to each other, and having a slide between the two pistons.

2. The making of the slide in two parts, so that as the surfaces wear away they may be set up and be maintained constantly in contact with the two pistons.

3. The mode of constructing the slide, whereby it acts as a slide valve for admitting the steam to flow into and from the steam cylinders, and at the same time, as an abutment for the steam.

4. The mode of constructing one of the end covers of each of the steam cylinders in separate parts.

5. The mode of affixing the pistons on their axes by enlarging the axes at their middle portions.

Alfred Charles Hobbs, of New York, engineer. *For certain improvements in the construction of locks and other fastenings.* Patent dated February 23, 1852.

The improvements claimed by Mr. Hobbs are as follows:—

1. The use and application of a moveable stump to the bolt of locks, or attaching a moveable piece to the stump, or the stump to a moveable piece, for the purpose of preventing the position of the tumblers being ascertained by applying pressure to the bolt.

2. The use of a compound or double tumbler for the same purpose.

3. An arrangement, either by a circular or parallel motion, in which the bit of the key, detached from the stem, is carried into the lock, and made to operate upon the tumblers so as to bring them into a suitable position preparatory to shooting back the bolt—the key-hole being completely closed while the key-bit is operating on the tumblers.

4. A peculiar construction of lock, in which the bolt has a series of rectangular slots, and moves both vertically and horizontally, operating by a single set of slides or tumblers.

William Edward Newton, of Chancery-lane, civil engineer. *For improvements in the manufacture of coke, and in the application of the gaseous products arising therefrom to useful purposes.* (Being a communication.) Patent dated February 23, 1852.

This invention consists in obtaining ammoniacal salts from the vapours evolving from ordinary coke-ovens during the process of coke-making. The products of combustion are conducted or drawn off by a blower into a flue, in which is placed a refrigerator, and they then pass into a condenser or chamber, where they come in contact with surfaces over which trickles a stream of some solution (such as sulphuric acid and water) capable of taking up the ammonia which is subsequently obtained from the solution by concentration. The non-condensible gases pass off from the condenser, and may be allowed to escape into the air, or be applied to heating or other purposes.

Claim.—The application to coke-ovens of an apparatus by which the gaseous products evolved by the combustion of coal therein may, without interfering with the ordinary process of coking, be drawn off and conveyed to a receptacle or chamber, where they may be separated from each other and combined with other chemical agents to form valuable products, or may be applied to other useful purposes.

Jean Theodore Coupier and Marie Amedee Charles Mellier, of Maidstone, gentlemen. *For certain improvements in the manufacture of paper.* Patent dated February 23, 1852.

The *first* part of this invention consists in manufacturing pulp for paper-making from straw and other similar vegetable matters, and from the bark of the willow, osier or chesnut-tree, by the use of a boiling solution of hydrate of soda or potash, in conjunction with other chemical means, and without mechanical operations.

The patentees conduct their process as follows:—They make use of an open vessel with a perforated false bottom, on which are placed the materials to be operated on, previously cut or otherwise divided into short lengths. From the top of this vessel (which is to be closed while the operation is proceeding) a pipe leads to a second vessel capable of holding from 60 to 70 gallons, in which is placed the alkaline solution, and which is employed at a strength of from 7 degrees to 10 degrees Baumé. The end of the pipe in the first vessel is provided with a rose-head. When the process is to be commenced, steam is turned on into the alkaline solution, and its temperature raised to the boiling point. An excess of steam is then admitted, and the solution forced through the pipe and dispersed in a shower over the straw; when the solution is exhausted in this way, a fresh supply is introduced, and this operation repeated. A communication is established between the vessels by another pipe from underneath the false bottom of the first, and a circulation of the heated liquor is thereby maintained for about eight hours. Hot water is then forced through, and this washing is continued until the liquor comes off of a strength of about 1° Baumé. Cold water is then supplied to the materials, and passed through until it comes off clear. In order to bleach and disaggregate the fibres, they are then submitted to the action of a solution of hypochlorite of alumina or other hypochlorite, of a strength of about 3° Baumé, and again washed in hot water in order to remove the superfluous bleachin liquid. This reduces the mass to the condition of half stuff which is manufactured into paper according to the usual modes of operating with or without the addition of rag pulp. The quantity of alkaline solution consumed by the above process will be about thirty to forty gallons for every hundred weight of fibre, and of hypochlorite about 25 per cent. of the weight of fibre. The hydrate for the alkaline solution may be obtained by dissolving soda or potash in lime water, and decanting the clear liquor; and the hypochlorite of alumina for the bleaching process by dissolving sulphate of alumina in a solution of hypochlorite (common chloride) of lime. The waters obtained by the first process, when evaporated, yield a resinous soap, which may be mixed with other materials, and burnt as fuel, or used in the unmixed state.

The above process is applicable also to flax waste, cotton waste, hemp, tow, &c., but does not supersede the necessity of first converting these materials to half stuff.

The *second* part of the invention consists in treating wood shavings (pine, ash, elm, and beech are suitable for this purpose) with nitric acid in order to obtain therefrom a pulp to be used in the manufacture of paper.

In carrying this part of the invention into effect, the patentees employ two vessels in connection with each other, having perforated false bottoms on which the shavings to be operated on are placed in a damp state and pressed. About 80 per cent. by weight of white nitric acid (of a strength of 36° Baumé) diluted to about 5° or 6° Baumé, is then added to the shavings in one of the vessels, and after standing about four hours, heat is applied until ebullition commences, and nitrous fumes are evolved. These fumes are caused to pass into the second vessel, where they come in contact with the damped shavings, and are partially converted into hyponitric acid. When the boiling has been continued for a sufficient time, the shavings are subjected, for about two hours, to the action of solution of hydrate of potash or soda of a strength of about 2° Baumé in the manner before described, are washed, and they are then bleached by hypochlorite of alumina, using, however, only about two per cent. by weight of the materials in making the solution. This last operation, with the aid of subsequent washings, converts the shavings to a state of half stuff, which may be used alone or with rag pulp, according to the usual methods. The acid liquor employed in operating on the first batch of shavings, after having about 40 cent. of the weight of the materials added to it, is used for treating another quantity, the nitrous fumes evolved being applied as before described. By evaporating the used acid liquors, oxalic acid may be obtained, as well as an acid of a character analogous to nitropieric acid.

Claims.—1. The mode described of reducing vegetable matters into pulp by means of a solution of hydrate of soda or potash and the use of hypochlorites. Also, the mode of employing hyochlorite of alumina for bleaching vegetable matters in the process of manufacturing paper.

2. The mode of employing nitric acid in manufacturing other pulp, and obtaining other products.

Charles Cowper, of Southampton-buildings, Chancery-lane. *For improvements in machinery for combing and preparing wool and other fibrous substances.* (Being a communication.) Patent dated February 23, 1852.

This invention consists principally in a method of holding wool and fibrous materials while being combed, and of feeding the same to combing-machinery, by means of

two bars, straight or circular, one of which is moved along the surface of the other in a direction transversal to that in which the material is being fed in. The claims also include a peculiar construction of circular combing-machines, and the application of steam to wool while being held between bars as aforesaid.

THOMAS YOUNG HALL, of Newcastle-upon-Tyne, coal-owner and colliery viewer. *For improvements in screens for screening coal and other substances requiring to be screened.* Patent dated February 23, 1852.

These improvements consist in making the longitudinal or screening-bars of screens for screening coals and other substances to rest on pins or pivots, fixed to moveable cross bars placed at such an angle with respect to each other, and so connected, as to form a combination resembling the letter V or W, so that, by means of a screwed rod and handle, their angular position may be changed, and the spaces between the whole of the bars which are attached to the levers, or any portion of them, thereby varied or adjusted according to the size desired to be given to the meshes or interspaces. The screens can be also screwed up so that the bars will go close together, and form a dumb screen or shoot. They may also be made either fixed or portable, and in situations where power can be obtained from any prime mover, and where the necessary height or inclination of the screen is limited, the patentee prefers to give them a lateral motion, technically termed a shake, the screens being hung on links or placed on vibrating supports, by which means the coals or other substances can be screened with the screens placed at a very slight inclination.

Claim.—The means employed for varying the position of the bars (with or without independent framework), and for making the screens either fixed or portable, and forming them into a dumb screen or shoot, as before described. Also, the application of the "shake" to the same in certain cases, as described.

No English Patents Sealed this Week.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Aug. 26	3357	F. G. Yeates	Winkworth's-buildings	Box for string, &c.
28	3358	C. Carr	Stockport	Spindle, rail, and bearings, for spinning, doubling, and winding machines.
,,	3359	R. Clark	Strand	Fastening for the nozzle of candle-lamps.
,,	3360	W. Sanderson	Sheffield	Balance handle for knives and forks, and table steels.
30	3361	E. Harris	Ebby, near Stroud	Corrugated zinc wash slab.
31	3362	J. Dicker	Islington	Traductor.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Aug. 28	460	H. and G. Turner	Ipswich	Garment.
Sep. 1	461	P. Effertz & E. Zorn	Wellington-street, Strand	Separation hinge.
,,	462	W. D. Hornsby; T. A. Burrage; I. L. Barber	Bartholomew-close; St. John's-square; Norwich	Netting pattern type.

CONTENTS OF THIS NUMBER.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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Edited by J. C. Robertson, 166, Fleet-street.

MILLS'S PATENT MARINE STEAM BOILERS.

Fig. 1.

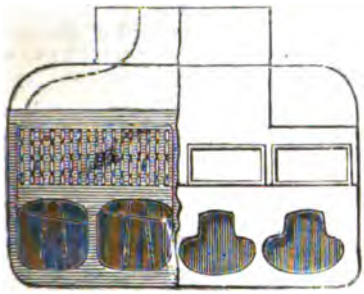


Fig. 2.

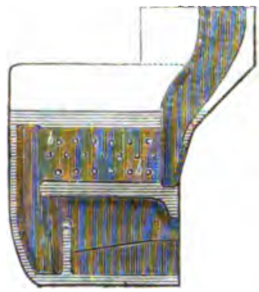


Fig. 3.

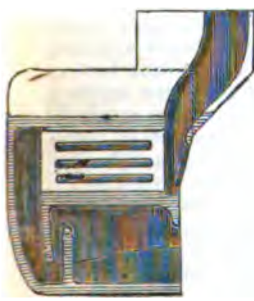
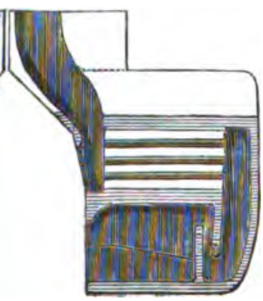


Fig. 4.



F g. 5.

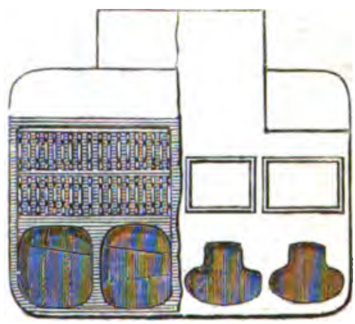
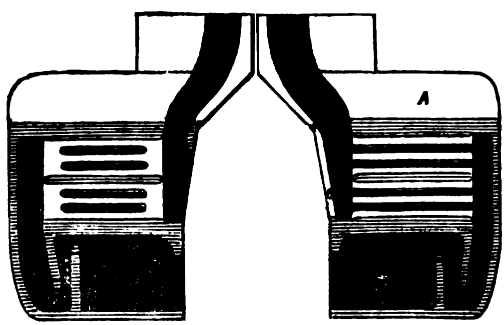


Fig. 6.

Fig. 7.



MILLS'S PATENT MARINE STEAM BOILERS.

(Patent dated November 22, 1851. Specification enrolled May 22, 1852. See ante vol. lvi., p. 439.)

Specification.

My invention, in so far as regards steam engine boilers, consists in the improvements represented in figures 1 to 10, both inclusive. Fig. 1 is an elevation, partly in section of a steam boiler constructed for marine purposes, and with a special view therefore to including in a given space the largest possible amount of heating surface combined with strength and durability. The boiler is tubular, and the tubes *a a*, are flat-sided and narrow, with hemispherical indentations or corrugations, two or more (*b b*), formed in them as separately represented on an enlarged scale in fig. 9. These indentations serve two purposes; first, by bringing the indented parts on one side of each tube opposite the indented parts of the opposite side, so that the two shall touch and abut against each other, they serve as so many internal stays to the tube, and impart great additional strength thereto; and, second,

Fig. 9.

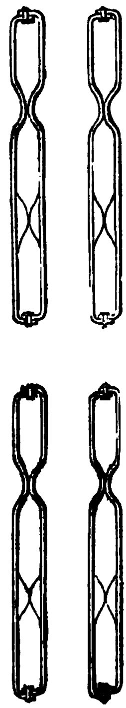
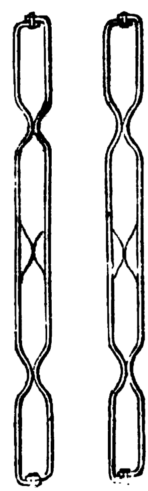


Fig. 10.

Fig. 8.



when a number of such tubes are arranged in the above position, the hollow sides of the indentations form water-spaces (running in the reverse direction to the tubes themselves), which add considerably to the amount of evaporative surface. The flues are bent, and overlapped at the ends, or at top and bottom, as the case may be, and firmly riveted together, as shown in figs. 8 and 9, or they may be united at these points by a curved joint-piece, as shown in fig. 10, or by common angle iron in the usual manner.

Fig. 2 is a transverse section of the boiler represented in fig. 1, showing an elevation of one of the flues with the indentations, or corrugations *b b*.

Figs. 3 and 4 are transverse sections exemplifying a modification of the preceding mode of construction. In fig. 4 the tubes are indented, or corrugated throughout

their whole length, but these in fig. 8, for a portion only of their length, the corrugated parts forming on the hollow sides longitudinal water-chambers, which are made to meet, as shown in section, fig. 1. The mode of fixing amidship, adopted in figs. 3 and 4, is intended for vessels of large power, where there is sufficient space to get a well-ventilated stoke-hole. Fig. 5 is an elevation, partly in section of a marine steam-boiler, having two tiers, or sets of flues, *c c*, placed one over the other, and lying horizontally over the furnaces, and connected at the ends in the manner before described. This arrangement is intended to be applied where the height of the boiler is no object.

Fig. 6 is a transverse section of fig. 5, showing an elevation of one of the flues and the arrangement of the indentations, or hemispherical chambers, *d d*.

Fig. 7 shows two transverse sections of a boiler constructed with two sets of flues as above described, having the flues formed of plates of iron indented, or corrugated and arranged in the same manner as in figs. 3 and 4. The section A, of fig. 7, shows no smoke-box or door, but a water-space *e*, placed between the flue *f*, leading to the uptake, and the front of the boiler, an arrangement which is adopted wherever space and other circumstances will permit. The flues would in that case be cleaned either from the back of the furnace, or from the uptake.

THE EFFECT OF THE ROTATION OF THE EARTH ON RAILWAY TRAINS. PROPOSED AT A SMITH'S PRIZE EXAMINATION, AT CAMBRIDGE, IN JANUARY, 1847 [BEFORE FOUCAULT'S EXPERIMENTS].

Sir,—It may not, perhaps, be known to the generality of your valuable Magazine, that the effect of the rotation of the earth on a railway train had engaged the attention of mathematicians some time before M. Foucault's pendulum experiments attracted so much general attention to this subject. The problem was proposed by Professor Challis to the candidates for the Smith's Prizes, at Cambridge, in January, 1847, in the following form:—

"A railway train travels due north or south in a given latitude λ with a velocity V; compare the resistance arising from the earth's rotation with the resistance to the same train travelling with a velocity V^1 on a curve line of radius R.

Prove that if the resistances be equal,

$$R = \frac{V^{1\,2}}{V\omega \sin. \lambda},$$

ω being the earth's angular velocity; and calculate the numerical value of R for the case in which V = 50 miles an hour, V^1 = 5 miles an hour, and

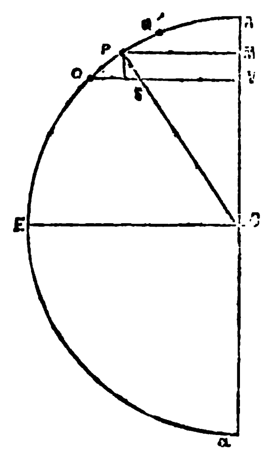
$$\lambda = 54° = \sin.^{-1} 0{\cdot}809."$$

The following solution is at the same time simple and immediately applicable to M. Foucault's experiments, and may be interesting to some of your readers:

Let APE be the meridian in which the train travels.

PQ the arc described in 1″ = V, which is ultimately a portion of the tangent line at P.

Draw PM, QN perpendiculars on the polar radius AC, and PS, on QN, and join CP, CE being equatorial radius.



Then ω. PM = velocity of point P on earth's surface in consequence of rotation.

ω. QN = velocity of point Q.

Hence the railway train, in travelling from P to Q in 1″, has a velocity

$$= \omega.\ QN - \omega.\ PM = \omega.\ QS$$

impressed on it in a direction perpendicular to the meridian.

Hence if W be the weight of the train, and g the accelerating force of gravity, the pressure of the rail to effect this

$$=\frac{W}{g}\,\omega.\,QS.$$

Now the triangle PQS is very approximately rectilinear, and $\angle$ CPQ = a right angle = $\angle$ SPM:

Whence it follows that $\angle$ SPQ = CPM, and the right-angled triangles PSQ, CPM are similar. Hence

$$\frac{QS}{PQ}=\frac{CM}{CP}=\cos.\ PCA=\sin.\ ECP=\sin.\lambda,$$

$$\text{or } QS=V\sin.\ \lambda.$$

Hence the resistance of the rail arising from the earth's rotation = P (suppose)

$$=\frac{W}{g}\,\omega.\,V\sin.\lambda.$$

But resistance to the same train travelling with velocity V^1 in a curve line radius R = P′ (suppose)

$$=\frac{W}{g}.\ \frac{V_1^2}{R},$$

$$\therefore\ P : P' :: \frac{W}{g}V\omega\sin.\lambda : \frac{W}{g}\ \frac{V_1^2}{R},$$

$$:: 1 : \frac{V_1^2}{RV\omega\sin.\lambda}.$$

If they are equal, we must have

$$R=\frac{V_1^2}{V\omega\sin.\lambda}.$$

Substituting the numerical values given, we find

$$R=\frac{\left(\frac{5}{60\times 60}\right)^2}{\frac{50}{60\times 60}\times\frac{2\pi}{24\times 60\times 60}\times 0{\cdot}809.}$$

$$=\frac{24}{4\pi\times 0{\cdot}809}\text{ miles}=\frac{6\times 1760}{\pi\times 0{\cdot}809}\text{ yards.}$$

$$=4154{\cdot}9\text{ yards nearly.}$$

Whence it appears that the effect of the rotation of the earth on the motion of a railway train is quite inappreciable.

Now, let QPQ′ be a small arc of the meridian; and suppose a perfectly *smooth* table to be placed touching the earth at P; and let a body begin to move in the direction of the meridian through P, making equal excursions on each side of P. Then, when it has arrived at a small distance r from P, it appears from the preceding investigation that the point of the table, at which it arrives, has a velocity ωr sin. λ *relatively* to it—hence the body will appear to move in a direction *opposite* to that of the earth's rotation with a velocity ωr sin. λ, or with an angular velocity

$$\frac{\omega r\sin.\lambda}{r}=\omega\sin.\lambda.$$

Hence, since this is independent of r, the effect is the same as if the body described a path QPQ′ in a plane which has relatively to the meridian plane the angular velocity ω sin. λ. If, therefore, T be the time when the planes will again coincide, or their angular separation $=2\pi$

$$T.\omega\sin.\lambda=2\pi,\text{ or}$$

$$T=\frac{2\pi}{\omega}\operatorname{cosec.}\lambda=24^h\lambda.$$

the common expression.

This is evidently the case of the pendulum neglecting the disturbance caused by the tension of the string by which it is suspended, which produces an elliptic motion.

When the plane in which the body moves has separated from the meridian, we must no longer take r, the length of the excursion from P, but its projection on the meridian plane. Hence, if ϕ be the angle between the planes, the relative velocity

$$=\omega r\cos.\phi\sin.\lambda,$$

and the angular velocity

$$=\frac{\omega r\cos.\phi\sin.\lambda}{r\cos.\phi}=\omega\sin.\lambda.$$

When the plane is due east of the meridian plane, the linear relative velocity is zero; and this method might seem to fail, but the projection of r is also zero; and the angular velocity

$$=\frac{0}{0}=\omega\sin.\lambda,$$

as before.

I am, Sir, yours, &c.,

A Constant Reader.

ENGLISH FIRE-ENGINES v. GERMAN PREJUDICE.

Sir,—Immediately after the disastrous fire which destroyed a large portion of the City of Hamburgh, in 1842, F. Huth, Esq., presented that city with a 7-inch,

London Brigade fire-engine of the most modern and improved construction, and the Hamburgh Senate procured from Mr. Merryweather, of Long-acre, a still more powerful fire-engine, with 9-inch barrels, like those which had been so successfully employed by the fire-police of Liverpool, Belfast, and other places. I had the pleasure of accompanying this engine to Hamburgh, and exhibiting its capabilities to the authorities; but was much struck by the ill-feeling with which this beautiful machine was regarded, not only by the firemen (an interested body), but by the German public at large. A short account of these circumstances appeared at page 173 of your 38th volume, which concluded with the following remark:

"It is greatly to be regretted that the prejudice of the Hamburghers, and their antipathy to everything that is English (except their money) will, most probably, prevent the useful employment of either of these splendid engines until driven to the last extremities."

Soon after I quitted Hamburgh, the Senators, in order to effect the preservation from injury of the English fire-engines, and to ensure their application when needed, handed them over to the military, making them part of the *materiel* of the garrison. After the lapse of nearly ten years, the superiority of the English fire-engines becomes manifest, as shown by the following extract from the *Times* of August 28th.

(*Merryweather's 9-inch Barrels.*)

"HAMBURGH, AUG. 24.—Yesterday, at noon, a fire broke out in one of the warehouses in this city, in the Deichstrasse, almost close to the fatal spot whence emanated the great fire in the year 1842, and bade fair at one time to have resulted in fearful consequences, from the place in which it broke out and the adjacent warehouses containing quantities of oil and cotton. Fortunately, however, it was discovered in the daytime; for had it taken place during the night, no person could have calculated upon the result, as the wind blew in the direction of a number of closely-built warehouses, where great difficulty would have existed in bringing the engines to bear upon the points of the greatest danger. As it was, and although there were at least fifty fire-engines brought to bear upon the buildings threatened with destruction at one time, and, notwithstanding a very plentiful supply of water, and the most active and prompt energies of the military and firemen in attacking this most awful enemy, it took fully three hours before they could master the element of destruction. Indeed, the whole of the forces of the city brigades were employed up to 9 o'clock last evening before the danger could be considered mastered; and during the whole of the night a plentiful discharge of water had to be kept up on the premises. The *London fire-engines*, a couple of which are now generally employed on such urgent occasions, and are worked by the regular military, under the command of an officer, performed the greatest service of any, and the people now begin to perceive more clearly than ever that, notwithstanding the great activity used by their own firemen (*who seem to have a dislike to these engines in general*) in putting out trifling fires with their own, such great fires, and where the water has to be conveyed often for some distance with any effect, can only be mastered by these powerful machines, directed by men under an independent command, by order of the authorities specially. Indeed, it has been freely admitted now, that one of these engines performed more service than half-a-dozen of their own; and on no occasion did I witness the efficacy of them to greater advantage than yesterday, when the water had to be conveyed to a very considerable elevation, above the power of any other to reach, and discharged in such streams that mastered the element wherever it was gaining the upper hand. This fact will give great satisfaction to those German gentlemen who so generously presented the city with the most powerful of them, named 'Hamburgh,' in the year 1842. The firemen, in general, are very active and very courageous in their operations in putting out fires, and as prompt in their appearance at the scene of danger as in any part of Europe; but they have still too much faith in their own engines, and stick too much to old prejudices. Experienced persons, however, on most occasions, look with greatest confidence to the English engines, and like to see them employed."

Hamburgh has, for some time past, been protected by a very perfect system of high-pressure water service for the extinguishing of fires, arranged and executed by Wm. Lindley, Esq., C.E., which has been found pre-eminently useful in extinguishing fires in their earliest stages.

There can be no doubt that the high-pressure system, which is in full operation at Liverpool, Philadelphia, and many other places, is of great value;

the recent occurrence in Hamburgh, as well as some previous fires in the above-named places, go to prove that a more powerful system of apparatus must still be kept in reserve for the purpose of dealing with those conflagrations which, from the progress they have made before discovered, the magnitude of the buildings, the inflammable nature of their contents, or other accidental causes, are quite beyond the means of extinction by the simple "hose and jet," the number and dimensions of which must necessarily be limited.

The utility of the constant supply of water under pressure can hardly be overrated, furnishing, as it does, the means of almost *instantly* attacking and extinguishing incipient fires. Such an arrangement affords (as I have stated in evidence before the General Board of Health—Report of 1850) the means of extinguishing two-thirds of all the fires that occur. At the same time it would be most perilous to depend *solely* upon such an arrangement, because conflagrations will occasionally occur requiring for their suppression a more concentrated force than could be obtained from any ordinary system of waterwork service.

I am, Sir, yours, &c.,

WM. BADDELEY.

13, Angell-terrace, St. Peter's, Islington,
September 5, 1852.

SHOULD GOVERNMENT BE THEIR OWN MANUFACTURERS?

In the naval department the expenditure for providing the *material* may be considered as at least equal to that for engaging the services of the *personal;* whether this *material* should be provided in a manufactured state, or whether it should be manufactured on Government establishments, has been long, and still is a question much disputed, and in certain respects it may be said to materially concern mechanics of all descriptions. It has been asserted, that by manufacturing that *material* on Government account, both the mass of operatives, and of private master manufacturers are injured; the truth of this seems worth investigation.

As to operatives of the many denominations employed in a naval arsenal, a little inquiry will show that they are employed more to their own advantage by Government, than in any private manufactory, and that supposing work to be carried on with equal thrift in both, as many operatives will be employed in the manufacture of a given article by whoever it is made, so that as to numbers they would in both cases be the same: were it true, as is said, that Government employ more hands than are necessary, of course this disregard of the public purse could only be to the advantage of the general mass of operatives.

No one can be compelled to work for Government; it is evident, consequently, that the many candidates for such service are compelled to seek it by a perception of certain advantages it affords. Amongst the chief of these is certainty of continued employment. Government establishments are not broken up like private ones, by bankruptcy of the employer, by the destruction of the premises by fire, inundation, or otherwise, by changes of fashion at home, or by dimi nution of demand from abroad, but in all which, and many other circumstances, the working hands in a private manufactory are turned adrift. In a naval arsenal the form of a ship may be changed, the different sea-stores may from time to time be varied; but still, whilst a fleet shall be required for our defence, ships must be continued to be provided, equipped, and stored, and men must be employed to do the necessary work; hence, when once engaged in a naval arsenal, continuance in it may be looked upon as sure to the industrious operative.

A second great advantage to the operative in Government service is, steady rate of pay. The private manufacturer habitually lowers the wages of his people when demand for his wares diminishes; though he may raise the wages at other times; but such fluctuations are injurious to the working man, both in a worldly and in a moral sense. In prosperous times he is tempted to flatter himself they will continue, and regulates his expenses conformably to abundant present means—they are diminished, he must forego some comfort become, from enjoyment of it, to be regarded, as it were, a necessary, and thus arises discontent. Forethought might prevent such evil consequences, but although so much as it has been recommended to working

men, that in times of prosperity they should lay by a something against the rainy day, how rarely has the advice been successful. Would that it were so very generally!

Some of the other advantages of Government service a man might procure for himself whenever employed, but which he seldom has the prudence to secure. For instance, superannuation allowance, the like of which any one may obtain by means of a deferred annuity. In Government service superannuation allowance in reality constitutes a part of pay; though from its being by no means certain, the prospect of superannuation is far from so advantageous as it might be made to be, whether to the operative or to the public purse. Sir Samuel Bentham, when devising, in the year 1800, new regulations for the Dockyards, convinced the then Board of Admiralty, and afterwards Lord St. Vincent, of the expediency of giving to artificers a superannuation that should be *certain*; the Comptroller of the Navy objected to the measure; to which Sir Samuel replied, as follows:

"With regard to Art. 40, in which it is proposed that superannuation should be allowed to all artificers after a certain number of years' service, or when disabled in the service, the Comptroller observes, 'that he approves of the measure,' 'but as it is the general practice, and is now considered as a *favour*,' he could not 'recommend any general rule to be made upon it. It would then lose its value, and continual applications would be made to receive it.'"

On this, Sir Samuel observed, "But in my opinion it is essential that the superannuation of the artificers, in order to its answering its intended purpose, should be arranged according to an established rule; that is, that it should take place, as of course, after a certain number of years' service, excepting only in cases of specific misbehaviour. According to this plan, the diligent and industrious artificer would know what he has to trust to, and the public would no longer suffer, as at present, in consequence of the retention, from motives of humanity, of infirm men in the service after they have ceased to be able to earn their pay, but who would, if discharged, according to the present practice, be left destitute of the means of subsistence."

. . . .

"But whatever be the amount of the allowance, I cannot admit that there is any reason to apprehend that it could lose anything of its value by being made *certain*, according to an established rule; on the contrary, I look upon a *fixed* superannuation, which a man may be assured of as his right at the expiration of a certain number of years, as one of the most effectual inducements in proportion to its real cost, that can be held out for the purpose of attaching the artificers to the public service."

His reasoning on this subject is applicable to many private manufactories, the introduction into which of a similar practice would be productive of very beneficial effects. Many masters do at present sometimes give sums of money to old and faithful servants, and still oftener retain others after their power of doing a fair day's work has ceased. Now, were these same manufacturers to establish, according to fixed rules, a rate of superannuation, commencing after a certain number of years' service, that rate increasing with the man's years, and consequent infirmities, it would, doubtless, have a most salutary effect on operatives—it would relieve them from anxiety as to their means of subsistence in old age, and could hardly fail to check their frequent disposition to leave a good master and steady employ, for the sake of some temporary augmentation of wages. The Saint Katharine's Dock Company do, or did a few years ago, provide an accumulating Superannuation Fund for all their servants; for this purpose 5 per cent. is deducted from the amount of all salaries, and 2½ per cent. on all wages. This mode effects the purpose, but it is questionable whether so agreeably as might be to the men: might they not better like to engage themselves at somewhat lower wages to some secure superannuation, than to be *weekly* galled by a deduction of sixpence from every pound counted upon as due for wages? Against such a measure it may be truly said, that the instability of private manufactories would render such engagements anything but secure to the operatives. This admits of easy remedy, masters might agree with some safe Insurance Company to take upon itself the deferred annuities to which operatives might be entitled; doubtless this might be ef-

fected on advantageous terms to all parties, and would greatly check the too roving disposition of working men, they, seeing that on leaving a regular service before having acquired a right to superannuation, their claims on this score would be forfeited. But this, like many another hint, would require consideration in the arrangement of details before it could be brought forward in a working state.

It is said, and generally credited, that contracts with Government are open to *all* persons; and therefore, that the manufacturing on Government account is the withdrawal of so much employment from the general mass of private manufacturers. This is a much mistaken notion, for, in point of fact, Government contracts are confined to a very few individuals. This arises from circumstances that are partly avoidable, but in regard to *manufactured* articles, from causes that always must prevent effectual competition. In regard to causes that are avoidable, when Lord St. Vincent presided at the Admiralty, he induced Sir Samuel to investigate and represent officially some of them that might be easily removed, such as the requiring a personal attendance of the tenderer, or of an agent for him; a practice which Sir Samuel exhibited as being equally detrimental to the public service and to private individuals—unless where they were otherwise than honorably actuated. That this requirement is altogether useless is habitually exemplified in the Ordnance Department. Another prejudicial and avoidable practice in the Admiralty Department, is the shortness of time allowed for the furnishing of stores; and, further, persons unacquainted with the fees of office required, and the customary official mode of payment, are deterred from making offers, from apprehension of some unknown consequence of such details. But the great impediment to competition in regard to *manufactured* articles, is the immensity of quantities required for the Navy—a circumstance which must always preclude the *generality* of private manufacturers from competing with the wealthy capitalist. Enormous manufacturing premises, furnished with often very costly machinery, are alone competent to the production of quantities required by Government, so far exceeding the ordinary demands of trade; it is consequently the great capitalist alone who can undertake Navy contracts for manufactured articles; so that all other manufacturers are virtually excluded. It may be added, that none but those who count upon a preference with the naval authorities willingly risk large capitals in providing for the supply of Government; and when they do it, it is in the prospect of deriving extraordinary profits—profits not only sufficient to cover ordinary chances of disuse of the article required, but such also as would compensate for the risk, there always must be, that some favoured competitor might arise. It was from such causes, that, before the Metal-mills were established at Portsmouth, the contractor for sheating obtained enormous profits; besides many advantages derived from allowed of over weight of old copper delivered to him, he received by contract no less than 4½d. per pound for all the sheathing he re-manufactured; though no sooner were the Portsmouth mills at work, than he was desirous of contracting for the re-manufacture of sheathing at the reduced price of 2½d. per pound. That contract had given the contractor a profit amounting to the immense sum of 40,000*l*. a year, and this had been obtained by reason that competition for the supply of Government is *not* open to all manufacturers. Competition was not then open to all, nor can it be so now. It is not the generality of even great manufacturers who can compete, but only those who have enormous capitals at command, and who are willing to risk it in buildings and apparatus for the supply of the Navy exclusively.

Thus it appears that operatives, so far from being injured by manufactures carried on by Government, are, on the contrary, often benefited thereby in many ways. In like manner it is not the *generality* of manufacturers that are deprived of employment by the measure, for competition is confined, and necessarily so, to a very few great capitalists. Viewing the subject in the light of general national prosperity, the whole population can be no otherwise than benefited by well-managed manufactories in naval arsenals, since every saving made in them is so much the less money that must be extracted from the private purse.

To manage well and profitably a ma-

nufactory on Government account, Sir Samuel proved by the experience of eight years in those that were under his sole direction,* that nothing more is necessary than "the introduction of that kind of *management* upon which the prosperity of private manufactories principally depends." M. S. B.

AMERICAN PATENT LAW CASES.

(From the *Franklin Journal.*)

Woodworth Planing-machine Cases.

Sloat v. Patton. Sloat v. Winslow. Wilson v. Snowden. Wilson v. Ashton.—Motions for Special Injunctions.

Before the Hon. John K. Kane, holding Circuit Court for the Eastern District of Pennsylvania.

There were four cases in equity heard during the April Sessions of the Court, on bills and affidavits upon application for special injunctions. The complainants in the several bills were the assignees of the exclusive right to use the Planing-machine of William Woodworth, for the extended term of the patent within the county of Philadelphia.

The infringement complained of in the first of the above suits, Sloat v. Patton, was alleged to consist in the use of a planing wheel of a nearly disk form, slightly inclined in its plane of revolution to the plane of the board to be operated upon. The planing-knives were so placed in this wheel, that when it revolved the edge of those knives generated the surface of an obtuse cone. It was stated by the complainant, that the board to be planed was controlled by pressure upon its surface by means equivalent to those described in Woodworth's patent; that this defendant thus employed a combination of pressure rollers with rotating knives, substantially the same as described in the Woodworth patent. It was further alleged, that the machinery employed by this defendant to tongue and groove the boards, was an infraction of another claim of the same patent. This machinery consisted of elliptical saws or plates placed on vertical axles in an inclined position to such axles, so that the teeth of these elliptical saws or plates would describe the convex surface of a cylinder when the plates were revolved. It was further said, that the means of controlling the board, while under the action of the tonguing and grooving wheels, were analogous to those patented.

The Court declined hearing argument from the defendant on the validity of the Woodworth patent at this stage, referring to previous trials and investigations in that Court as having determined that question. The defendant denied that the machines used by him infringed upon any claim of the complainant's patent. He asserted and read affidavits to establish the fact, that the planing-wheel employed by him was a simple disk, and described in its revolution a plane parallel with the face of the board, and not the surface of a cone. He said that in his machine pressure to control the board was neither used nor required to be used. His tonguing and grooving-tools, he insisted, were entirely unlike in form and principle of operation to the cutters of Woodworth. Many affidavits of a contradictory character were read on both sides, and Professor Byrne was examined orally on behalf of the defendant, and Harvey Waters on behalf of the complainants.

The machines used by Winslow and by Ashton, the defendants in the second and fourth of the above suits, it was alleged by the complainants, bore a still closer resemblance to those patented by Woodworth. It was contended that the tonguing and grooving apparatus in these machines was identical with that of Woodworth, and that the planing-wheels employed by these defendants were so placed as to describe a more clearly perceptible cone than in Patton's machine. On behalf of these defendants, it was admitted that the tonguing and grooving tools were similar to those of Woodworth; but it was insisted that the planing-wheel did not describe a conical surface, and that pressure was neither required nor used while the board was being planed.

Two bills had been filed against Snowden, the defendant in the third suit—one was filed by J. P. Wilson, as assignee of the Woodworth patent, and the other by J. P. Wilson, as assignee of the Barnum planing-machine patent. It was complained, that Snowden infringed on the Barnum patent, by using the precise machine described and patented by Barnum for planing; and that he infringed on the Woodworth patent by using the same tools and combination in tonguing and grooving as were described therein. The latter infringement was not denied by the defendant during the argument, but it was contended that the defendant had acquired a right to use the Barnum machine, by virtue of a license from Barnum, the former owner of the patent, and subsequently, it was contended, that he had acquired this right by the purchase of a machine from Barnum. The complainant denied that any valid title was acquired by Snowden in either manner as alleged.

* The Wood-mills, the Metal-mills, and the Millwrights in Portsmouth Dockyard.

During the course of the evidence, affidavits stating that the complainants had been unable to obtain access to examine the respective defendants' machines were read, and application was made to the Court for an order of inspection. Whereupon the following order was made:

"That the respective defendants do permit an inspection and thorough examination by Harvey Waters, on behalf of the complainants in the above cases, of the planing, tonguing, and grooving-machines in controversy, in each case respectively, and that the said expert be permitted to bring any specimens of the work done by the said machines; and that the said machines shall be worked by the servants of the respective defendants as the said Harvey Waters may request."

Mr. Waters afterwards was examined in Court as an expert, and exhibited specimens of the boards planed at the several machines. In the course of the trial, a very ingenious working model of a planing machine was introduced into Court by the last-named expert. Its essential feature was a Woodworth planing cylinder, so constructed and arranged that while the operation of planing was going on, this cylinder could be altered to a cone or to a disk, and *vice versâ*.

The four cases were argued at the same time. Mr. Campbell, Mr. Keller, and Mr. Harding appeared for all the complainants, and Mr. Cuyler appeared for all the defendants. Mr. Hubbell also appeared for Patton, and Mr. Taylor for Winslow.

The Court having taken time to consider, delivered the following opinion on the 28th of May last, granting injunctions in all the cases as prayed for.

Opinion.

The effect to smooth boards and reduce them to a uniform thickness by the rotary action of cutter knives set in the face of a disk, and made to revolve in the plane of the intended surface, is of ancient date. But from the time of Bramah, half a century ago, until now, it has never been successful. If it were practicable to construct a machine, mathematically accurate in all its parts, and of inflexible material, so as to prevent all possible vibration; and if, besides, the wood to be operated on could be first deprived of all its elasticity, then each cutter as it passed on its way, removing a certain portion of the board, would leave the surface absolutely finished behind it—and the other cutters and the same cutter returning in its revolution, all following in absolutely the same plane with the first, would pass over the finished surface, neither abraiding it nor compressing it, yet in contact with it.

But these conditions involve mechanical impossibilities. The strongest engine that ever came from the shops, vibrates sensibly when it encounters an intermitting resistance, and there is no such thing as a non-elastic. The practical consequence is, that the cutters after finishing their work, still continuing to revolve over the smoothed surface, will sometimes be impelled for the instant below the plane of their normal action; and on the other hand, the board partially compressed when under the action of each cutter in succession, but rising again immediately afterwards by its own elastic force, will present a new surface to be acted on by the next cutter—that surface varying in height according to the varying density and consequent elasticity of the board. This is illustrated by the *back-lash*, an irregular trace made on the finished surface by the cutters that continue to pass over it.

Woodworth was the first to propose a remedy for this, by placing his cutters on the periphery of a rotating cylinder, while he presented the face of the board in the tangent plane of their revolution. He thus prevented the cutters, while the board was moving, from tracing it a second time, and gave the *dip and lift cut* which has been so often recognised as the characteristic of his patented machine.

It is obvious that to make this cut, it is not necessary to place the cutters on a true cylinder. A cone, or even a dished wheel, scarcely deviating in appearance from a true disk, will produce the same effect, provided the board approaches and leaves the cutters in the tangent plane of their revolution. I had no difficulty, therefore, when the cases of Plympton and Mercer and others were before me, some years ago, in holding that a cone or dished wheel so arranged, was simply a mechanical equivalent for the cylinder of Woodworth; and the rulings then made, have, on more than one occasion since, received the sanction of both the judges of this Court.

Strange to say, in three of the cases now before me, the principal dispute has been as to the fact, whether the machine used by the defendants is or is not a *disk*, or, as it has been spoken of in the argument, a Bramah wheel? Numerous witnesses, some of them highly respectable, have testified that it is nothing else—and that its cutters move of course in the same plane, and parallel with the lower face of the board—in other words, that the cutting disk coincides in its revolutions with the finished surface. But it is as certain as any truth in the philosophy of mechanics, that in this they are mistaken—for the machine in its ordinary working leaves no back-lash, and the boards that

were passed through it by one of the gentlemen who inspected it under the Court's order, show unequivocal marks of the dip and lift out.

Neither witness nor counsel has explained how a disk which all describe to be like Bramah's wheel, and worked as his was, can produce results so different from his; nor how it happens that the results produced by it are so precisely those which would be produced by cutters revolving on a flattened cone. On the contrary, all admit that the machine does vibrate, and that the boards which it commonly works on are damp, if not wet, and of course easily compressed under the cutters. It is to exact more than a reasoning faith in human testimony, to assure us that such a machine acting on such a material, will in the hands of the defendants renounce the mechanical law which it has been exemplifying everywhere else for the last fifty years.

It is true, that upon *tramming* the disk with the bed-plate, in order to test their parallelism, the defendant's witnesses observed no deviation from the disk form. But though this were so, yet in just such a disk the cutters might be arranged in such a manner as to describe a cone when revolving; and Mr. Patton's cutters were not, and probably could not be, trammed. Besides which the axis of the disk was so adjusted at its upper extremity, as to give it at pleasure the oblique action which is adapted to the revolving cone, and yet to restore it again in a few minutes, with the disk parallel to the bed-plates.

When we consider that the machine while at rest can have its character thus easily modified, so as to give proof for the time of parallelism of its parts, if such proof be desirable, and that while in motion, it defies all scrutiny, revolving, it may be, some 3,000 times in a minute, and its three cutters therefore following each other with an interval between them of but the 150th part of a second; and that an obliquity in the disk, not exceeding the $\frac{1}{16}$th of an inch on its cutting diameter, would be sufficient to change its effective action; we can apprehend without difficulty that the defendant's witness may have fallen, very honestly, into error. But it is enough for us to know, that according to the laws of matter and motion, which are the condensed expression of all mechanical experience, the machine, as they describe it, cannot produce the effects, which we see that the machine produces in fact. The foot-print on the sand indicates with less certainty the form and pressure of the foot that made it, than a curved cut on the face of a flat board proves a corresponding curvature in the path of the cutting tool.

It is in vain to refer us for an explanation to the abnormal influences of vibratory or semi-elastic forces, without showing us what these influences are, and how they resolve—they resolve for the time a disk into a cone, or enable the machinist to trace a regulated curvilinear surface by the rectilinear movement of a plane. This is only to reassert the paradox in more general language, to prove the controverted fact by reference to an unknown theory.

I must hold, therefore, that the planing-machine of Messrs. Patton, Ashton, and Winslow, and Ashton and Beer, are essentially the same with the planing apparatus of the Woodworth patent.

The machine employed by Mr. Patton, and, as it is said, invented by him, for cutting the tongue and groove, is spoken of as an elliptical saw. It consists of a revolving saw-plate of lozenge shape, set at such an oblique angle as to make all the teeth on its periphery equidistant from its action of motion. In revolving it describes, of course, a cylinder, and its action is that of a rasp. It does not divide the board as a saw does; but performs the office of Woodworth's duck-bill cutter, somewhat less perfectly, and apparently at greater cost. The only points of difference are, that what would be the one cutter of Woodworth, is, in Mr. Patton's machine, effectively divided into several, so as to form a series of cutting disks or saws, the teeth of which abrade in succession the portions of the board to be removed, leaving the edges rough in consequence, instead of giving them the comparatively smooth surface of the Woodworth machine; and that while a broken cutter can be removed from the Woodworth disk, and a new one substituted, a tooth broken from Mr. Patton's saw destroys it. Whatever, therefore, may be the supposed interest or novelty of the elliptical saw, it must, in its adaptation to this particular use, be regarded as embodying the principle, and constituting, but for its inferiority, the mechanical equivalent of Woodworth's cutting-wheel.

The tonguing and grooving apparatus of the Ashton and Winslow, and Ashton and Beer machines, are confessedly those of Woodworth's patent.

The same is true of Snowden's; and his planing-machine is an equally direct piracy of the Barnum patent, now held by the complainant.

I have not, in this opinion, discussed the question of the validity or the extent of Woodworth's patent. These have been so often before almost all the Courts of the United States, as to make them inappropriate topics for interlocutory argument.

There must be at some time or other an end of controversy as to the character of a patentee's property in his invention; and now that twenty-three years have gone by since the Woodworth patent was issued and passed into litigation, I am disposed to recognize its parting claim to repose; *solve senescentem.* I therefore limited the discussion at its outset to the single question of infringement.

I have one more remark to make; it is prompted by a review of the devices employed by these defendants and those who have gone before them in similar controversies. I cannot but think that the time has come when, in this district at least, the attempt to mask an infringement of this particular patent should be almost regarded as a waste of ingenuity. It is a truth of large acceptation, both in policy and morals, that it is better in the long run to strive patiently for a legal property of one's own, than to persist in trespassing on the property of others. The invention which is set forth in letters patent *belongs* to the inventor —as rightfully as the house he has built or the coat he wears. It cannot detract from the dignity of his title, that the subject of it is of his own creation,—his thought conceived, and developed, and matured in the recesses of his mind,—that it has cost no man else anything, and asks nothing in return for the contribution it makes to the general wealth and happiness, but that security of enjoyment, during a limited period, which the laws engage for all other property without limitation of time, and without stipulating a price. It would be a reproach to the judicial system, if an ownership of this sort could be violated profitably or with impunity.

The complainant's counsel will prepare the draft of decretal orders in the several cases in accordance with this opinion.

AMERICAN REAPING MACHINES.—HUSSEY *v.* M'CORMICK.

The following interesting report has been made to the heads of the Royal College of Agriculture at Cirencester by the gentlemen who were requested to examine the working of the rival Reaping-machines during the recent trial. Mr. Curtis Hayward, whose name appears first on the list, is a country gentleman of great agricultural experience, from the neighbourhood of Gloucester; the other five are large tenant-farmers, near Cirencester; all men of standing, experience, and capital:

"We, the undersigned, having been requested by the authorities of the Royal Agricultural College to draw up a report expressing our opinion of the relative merits of the reaping-machine of M'Cormick, exhibited by Messrs. Burgess and Key, and Hussey's machine, improved and manufactured by Messrs. Garrett and Son, as displayed in their performances upon the College farm, at Cirencester, during a succession of trials, which had extended over several days, and the cutting of upwards of one hundred acres of different sorts of grain crops, report as follows:

"That, upon examination of the fields in which the crops had been cut, we found the work to have been generally well and satisfactorily done by both machines, but the stubble left by Hussey's appeared, in all descriptions of grain, rather the neatest and most even. In each case it had been considered necessary to follow with the horse-rake, which had effectually cleared up all the waste, amounting, it was found, on the wheat-stubble, to 2½ bushels per acre, after M'Cormick's, and 3½ after Garrett's machine. The wheat-fields we considered to have been favourable for the working of the machines, being generally level and clean, and to have presented fair average stand-up crops, in no places much laid, such as were likely to have produced, in a fair yield, about, probably, 30 bushels per acre, or rather more. The beans, a moderate crop, drilled 22 inches apart, had been cut principally by M'Cormick's machine, which had made very fair work; and the small portion upon which Hussey's had been tried was equally well done in both instances, leaving a more tidy stubble than the scythe, which had been applied to an adjoining portion of the crop. A crop of oats of about 25 acres, which we inspected, had been cut by the machines, and the oats were lying on the ground. The part cut by Hussey's appeared the cleanest and best work, but we considered either sufficiently well done. We made a careful inspection of the working of the two machines in a field of barley, laid down with clover and rye grass. The barley was estimated to produce about four quarters per acre on the average, but not equal throughout, a portion being estimated at five quarters, while other parts were put only at three quarters, the clover being regular and very luxuriant, particularly where the barley was lightest. We considered this crop, from its nature, to be a severe trial to the machines, though the day being fine and the clover dry were points much in their favour. The work made by each of them was highly satisfactory, and where the barley stood up, in point of cutting, everything which could be desired, and, even where partially laid, not much to

be found fault with. Hussey's cut the stubble lowest, and left it rather the more even of the two; but in more than one instance during our inspection it clogged, so as to require the machine to be stopped in order to clear the knives; an accident likely in our opinion to have occurred more frequently, and to have presented a serious obstruction had the crop been wet, or even dew-damp.

"From this objection M'Cormick's appeared to be free, as far as our observation went; the serrated cutters always clearing themselves, and its delivery was in this crop very superior; as the barley was laid out regularly by the one man on the machine conveniently in small heaps, with the ears generally upwards, while the two men who were employed in Hussey's to effect a lateral delivery, though apparently labouring more severely, could not deposit the barley so regularly, or in so good a form. The pace at which it was necessary for the horses to walk in order to secure the proper working of the machines appeared to us a most material feature in their relative claims. The horses which drew Hussey's machine were driven by a man riding on the near horse, and were kept going at a fast walk, which we estimated at nearly four miles per hour—certainly at a speed far exceeding the ordinary walk of regular cart-horses; and this speed appeared necessary to ensure efficient working; a requirement which must be very distressing to heavy horses. We find indeed complaints to be prevalent, as to this machine, that the work is too severe for a pair of horses for the whole day, which necessitates either more being applied, or the horses being changed, which of course increases the expense. M'Cormick's, on the contrary, was driven by a man seated on the machine, at the ordinary pace of cart-horses (say 2½ miles per hour), a rate at which a pair of horses might work a whole day, as at plough, and with as little distress; for this machine appears not only to be lighter in itself, but to work with more ease to the horses than the other, being so balanced as to throw a very slight pressure upon the horse's backs, while the weight on the pole of Hussey's is very considerable. We did not test particularly the quantity of work done by each machine in a given time; though, in the accounts recorded by Mr. Vallentine of the performances, it did not appear that there was much difference between them in this respect, each cutting between five and six roods per hour on the average. We consider, however, that if M'Cormick's machine, which clears a foot wider space than the other, is the lighter and less distressing to work, it must cut the greatest quantity, moving at that steady ordinary pace which we deem not only most desirable for the sake of the horses, but also for securing the continuous delivery of the sheaves with precision and regularity, and that any increase to be obtained by driving the horses beyond that speed would be dearly purchased. We are therefore of opinion that of the two machines thus tried, M'Cormick's has the advantage in lightness of draught, security of cutting and clearing itself under adverse circumstances, and in the more convenient delivery of the sheaves. We think it right to state, that M'Cormick's machine was under the management of Mr. Burgess, of the firm of Burgess and Key, the patentees, during the whole period of the trials, being worked by C. Stewart, their foreman; that the machine having been sent down in a state unfit for use, required a considerable time and much alteration before it could be made to work properly, after which the only accident to which it seemed subject was the slipping off of the driving strap, which happened several times. This, however, Mr. Burgess states is prevented in all their new machines by placing a rim on the wheel. We were given to understand by Mr. Burgess that the machine we saw was an old one sent from America, and not of their own workmanship, to which they attribute the accidents which occurred; not having seen any of those made by Messrs. Burgess and Key, we cannot speak as to the efficient state in which they are sent out; but unless they are free from the liability to such accidents as occurred at the commencement of these trials, we should consider such risks to be the most serious drawback to the machine. We may add also, that we do not see any reason why the cost of this machine should be so much greater than Hussey's. The Hussey machine was purchased by the college from Garrett and Son, and was worked by farm servants, under the direction of Mr. Vallentine, the able manager of the College farm, under whose superintendence and direction all these trials were conducted with great care, and at an expense of much time and attention, for which we consider the public are much indebted to him and to the college. A slight accident happened to this machine at the conclusion of our trials; but it was the first, we understood, which had occurred to it throughout the harvest, during which it has been pretty regularly employed.

"We cannot conclude our report without stating, that we consider each of these machines to possess many merits, and to be capable, even in their present state, of

doing much service to the farmer; but that they are both susceptible of very great improvement, especially in providing for the cutting and proper delivery of heavy and laid crops, and for working without the risk of the wheels clogging in wet and soft ground; points in which they are as yet defective.

" J. Curtis Hayward.	" Jon Barton.
" William Slatter.	" John Lane.
" Thomas Vaisey.	" Jas. Kearsey."

THE CENTRIFUGAL PUMP.

From the Proceedings of the Institution of Mechanical Engineers, at Birmingham, on the 28th July, 1852.

A paper was read by Mr. Andrew J. Robertson, of London, "On the Mathematical Principles involved in the Centrifugal Pump."

The general result arrived at by the investigation of this paper was that centrifugal action is not an economical mode of applying power for raising water, and that the *theoretical limit* to the *useful effect* to be obtained by centrifugal action alone is 50 per cent. of the *power* employed; a loss of 50 per cent. of the power being caused by the absorption of power in the *tangential* velocity given to the water, whilst the *radial* or centrifugal velocity alone is effective in raising the water. But the *practical limit* of the *useful effect* is reduced to 75 per cent. of the above 50 per cent., or only 37½ per cent. of the *power* employed, in consequence of the unavoidable losses arising from friction and practical imperfections.

The following supplementary calculations, illustrating the theory advanced in the paper, were supplied by Mr. Stein, respecting the results to be obtained from an experiment with Gwynne's centrifugal pump, that was described by Mr. Edwards. In that experiment, recently made by Mr. Edwards with a centrifugal pump, containing some further improvements of his own invention, it was stated that 650 gallons of water per minute were raised to a height of 17½ feet, by a revolving disc 13 inches diameter, and driven at 800 revolutions per minute; and the driving power was a high-pressure steam engine, with 8-inch cylinder and 18-inch stroke, working 100 double strokes per minute, with an effective pressure on the piston of about 43 lbs. per inch.

The piston being 50¼ inches area (8 inches diameter), and moving at the velocity of 300 feet per minute (200 strokes of 1½ feet).

The power expended on the engine was

sq. ins. lbs. feet.

$$\frac{50\frac{1}{4} \times 43 \times 300}{33,000} = 19\cdot6 \text{ horse power.}$$

The effect obtained was

gals. lbs. feet.

$$\frac{650 \times 10 \times 17\frac{1}{2}}{33,000} = 3\cdot4 \text{ horse power.}$$

Therefore the useful effect was 18 per cent. of the power expended.

According to the theory of the centrifugal pump in the paper, "the power expended on the pump is measured by the quantity of water delivered, raised to twice the height due to the velocity of the circumference of the arms; whilst the useful effect produced is the water delivered, raised to the height of discharge." In the above case the velocity of the circumference of the arms was 2,722 feet per minute, and the height due to that velocity (or the height of fall required to obtain that velocity by the action of gravity) is 32·3 feet, and twice the height is 64·6 feet, whilst the height of discharge was 17·5 feet.

Consequently the theoretical proportion of the useful effect to the power expended on the pump would be 17·5 to 64·6; and the effect obtained in the experiment as above being 3·4 horse power, the power required to produce that amount of mechanical effect under these circumstances (without considering the losses from friction and practical defects) would be

$$3\cdot4 \times \frac{64\cdot6}{17\cdot5} = 12\cdot6$$

horse power, or in this case a theoretical efficiency of 27 per cent.

The whole power employed having been 19·6 horse power, this leaves 7 horse power, or 35 per cent. of the whole, as the loss due to friction and practical defects both in the engine and the pump.

The Chairman asked Mr. Appold to give the particulars of his centrifugal pump, and of the experiments that had been made with it.

Mr. Appold showed drawings of the pump that he had shown at work in the Exhibition of 1851, and which had been experimented upon by the Jury at the Exhibition.*

Mr. Clift remarked that it appeared from the experiments, there was a great velocity that gave the maximum duty in centrifugal pumps, and they were more limited in application on that account than piston pumps.

* For Report of the Jury, see *Mech. Mag.*, p. 95, *ante*.

In the centrifugal pump, the velocity of the circumference must be constant for all sizes of pump for the same height of lift; that is, a pump 1 inch diameter must make twelve times the number of revolutions per minute of one 12 inches diameter, and both pumps will then raise the water to the same height, but the quantity of water delivered will be 144 times greater in the 12-inch pump, being in proportion to the area of the discharging orifices at the circumference, or the square of the diameter, when the proportion of breadth was kept the same, namely, one-fourth of the diameter in each case.

Mr. Appold showed a small pump, of the same proportions, but only 1 inch diameter, with which similar experiments had been tried as with the 1 foot pump, and proportionate results were obtained.

	Diameter discharged.	Gallons per Minute.
This pump	1 inch	10
And one	1 foot	1440
Consequently,	10 feet	14,4000

The height that the water was lifted being the same in each case, if the velocity of the circumference was the same.

A velocity of 500 feet per minute of the circumference raised the water 1 foot high, and maintained it at that level without discharging any; and a double velocity raised the water to four times the height, as the centrifugal force was proportionate to the square of the velocity; consequently,

500	feet per minnute raised the water	1 foot without discharge.
1000	.. ..	4 .. .. ..
2000	.. ..	16 .. .. ..
4000	.. ..	64 .. .. ..

The greatest height to which the water had been raised, without discharge, in the experiments with the 1 foot pump, was 67·7 feet, with a velocity of 4,153 feet per minute, being rather less than the calculated height, owing probably to leakage with the greater pressure.

A velocity of 1,128 feet per minute raised the water 5¼ feet without any discharge, and the maximum effect from the power employed in raising to the same height 5¼ feet, was obtained at the velocity of 1,678 feet per minute, giving a discharge of 1,400 gallons per minute from the 1 foot pump. The additional velocity required to effect the discharge is 550 feet per minute; or the velocity required to effect a discharge of 1,400 gallons per minute, through a one-foot pump, working at a dead level without any height of lift, is 550 feet per minute; consequently, adding this number in each case to the velocity given above at which no discharge takes place, the following velocities are obtained for the maximum effect to be produced in each case:

Feet per Minute.		Feet.	
1050	velocity for	1	height of lift.
1550	.. ..	4	.. ..
2550	.. ..	16	.. ..
4550	.. ..	64	.. ..

Or, in general terms, the velocity in feet per minute for the circumference of the pump to be driven to raise the water to a certain height, is equal to,

$$550 + (500 \sqrt{\text{height of lift in feet}}).$$

Mr. Benjamin Gibbons observed, that in the per centage of effect obtained from a given power, he did not think the centrifugal pump could exceed an ordinary piston-pump of good construction, where a large quantity of water was to be lifted a small height.

Mr. Appold replied that he did not know a piston-pump that yielded so good a duty as 70 per cent., which might be taken as the effect obtained from his centrifugal pump, when working at the most effective velocity. The greatest result obtained in the experiments at the Exhibition was 68 per cent., but some allowance had to be added in that case for the leakage through several large wood valves, 4 feet long, faced with leather, which were fixed in the suction-pipe of the pump, to pump the water from different levels.

Mr. B. Gibbons said he considered that a good plunger-pump would exceed 70 per cent. in duty.

Mr. Appold remarked that there were some situations where it was the most important consideration for a pump to be quickly and readily applied, that would discharge a very large quantity of water; and the centrifugal pump was found very advantageous in such cases, where the work could not probably be effected by other means. In one instance, in putting in the foundations of harbour works at Dover, a large quantity of water of 2,000 to 3,000 gallons per minute was pumped out by one of these pumps, which could not have been accomplished in the time by any other means, from the difficulty and delay of fixing ordinary pumps of that great capacity. The centrifugal pump had another important advantage for such applications, from having no valves in action when at work, which enabled it to pass large stones, and almost

anything that was not too large to enter between the arms.

The largest pump constructed at present on this plan, was erected at Whittlesea Mere, for the purpose of draining, and has worked there nearly a year with complete success. The pump is 4½ feet diameter, with an average velocity of 90 revolutions, or 1,250 feet per minute, and is driven by a double-cylinder steam engine, with steam 40 lbs. per inch, and vacuum 13½ lbs. per inch; it raises about 15,000 gallons of water per minute an average height of four or five feet. The cost of the engine and pump was about 1,600*l.* The following experiments were tried to ascertain the per centage of effect obtained from the pump;—the power employed being measured by taking indicator-figures from the engine, deducting in each case the power that was indicated when the engine was working at the same speed without the pump, which was found to take 10·6 horse-power. The quantity of water discharged was measured by calculating the overflow from an opening six feet wide in each case.

Experiments on Appold's Pump at Whittlesea Mere.

No. of Experiment.	1	2	3	4
Velocity of Circumference of Pump, in feet, per minute	1159	1357	1301	1329
Height of lift of the water, in feet and inches	3··0	4··1	5··0	5··11
Depth of water at point of overflow .... A	1··4	1··5½	1··3¾	1··2
Ditto at 17 feet distance .... B	1··7	1··8½	1··6¾	1··5
Gallons discharged per minute, according to the depth .... A	12429	14223	11706	9545
Ditto ditto.......... B	16104	18023	15288	13606
Theoretical discharge	17400	21587	15768	12803
Horse-power effective in raising the quantity .... A	11·34	16·88	17·79	17·17
Ditto ditto.......... B	14·70	22·38	23·24	24·49
Horse-power employed in working the Pump	23·00	40·90	29·90	39·80
Per-centage of effect to power employed, by calculation.......... A	49	41	60	43
Ditto ditto.......... B	64	55	78	61

The true result would be between these two calculations A and B, and the maximum effect might probably be taken at about 68 per cent. of the power; the same result as that obtained from the Exhibition experiments.

Mr. B. Gibbons observed that this centrifugal pump appeared a very ingenious machine, and very useful for some purposes; but the object was to obtain the plan which gives the greatest per-centage of duty, or the least waste of power. He was of opinion that for ordinary lifts, of say 10 to 30 feet, a bucket-pump of good construction performs more than 70 per cent. duty, and would be found consequently more economical in power than a centrifugal pump.

Mr. Appold said he found the centrifugal pump more advantageous for low lifts below 20 feet, than for higher lifts; but its most advantageous application was as a tidal pump, where the height of lift was continually varying, because it discharged more water the lower the lift, the pump still going at the same speed; but other pumps generally discharge only their cubic contents, no matter how low the lift. In one centrifugal pump, erecting at Shoreham, the height of lift will vary between 30 feet and nothing at different times of the tide.

Mr. Elwell inquired whether a centrifugal pump would be advantageous to be applied with a water-wheel, to assist in keeping the water-wheel at work, by returning a portion of the water when the supply was short?

Mr. Appold replied, that one of these pumps had been applied for that purpose by Messrs. Curtis, at the Hounslow Powder Mills, to keep the water-wheel going constantly in the summer time, when short of water. The water was pumped up seven feet high, by running the steam-engine a few hours extra at night, at a small expense,

which completely kept up the supply for the water-wheel, and avoided bringing the engine any nearer the powder mills. The centrifugal pump was very convenient and economical for this purpose, and the result was found so satisfactory, that a second pump was going to be erected for a similar purpose.

The Chairman inquired whether Mr. Appold considered the spiral form of the arms an essential point in his pump, instead of the radial arms in the other centrifugal pumps?

Mr. Appold replied that the oblique position of the arms was most important, and the large amount of duty obtained from his pump was entirely owing to it; he had at first tried straight arms inclined at 45°, but he found that the curved arms ending nearly in a line with a tangent to the outer circumference, gave the greatest effect.

The comparative value of the different forms of arms was proved by the experiments at the Exhibition mentioned before; the curved arms gave a duty of 68 per cent., the inclined arms 43 per cent., and the radial arms only 24 per cent., and he understood that the two other centrifugal pumps of Mr. Gwynne and Mr. Bessemer, which were also experimented upon at the Exhibition, did not give a higher duty than 24 per cent., as they both had straight radial arms.

THE ELECTRIC LIGHT AT LIVERPOOL.

This light was exhibited at the Egremont Ferry, on Saturday and Monday evenings last. It will be in the recollection of our readers that the first exhibition of this light took place some weeks back, from the top of the Victoria Tower, when, it being found to interfere with the existing lighthouses in the entrance of the Mersey, it was removed by the Dock Committee to the Landing-stage, where it was exhibited for several nights; but the elevation being too low, the light was too dazzling for the eyes of the boatmen connected with the ferry services. We suggested the necessity of a higher elevation, since which time it has been tried at Woodside for several nights, but, though in other respects perfectly satisfactory, the elevation was hardly sufficient. At Egremont the light was placed on the roof of the hotel, which is about the same height as the Victoria Tower opposite. We have been informed that small print was distinctly read upon the Landing-stage, and the whole of the intervening distance was kept in a state of brilliant illumination. The captain in charge of one of the ferry boats, we are informed, was specially deputed to report to his employers the effect of the light when steering from the Landing-stage to the Egremont Pier. He reported that, from the Landing-stage itself, he could distinctly see every vessel which lay in his course between that and the Egremont Pier; and that had the night been hazy or thick, he would have had no difficulty in distinguishing every vessel successively as he approached them. We are anxiously awaiting the permanent erection of the light under the auspices of the Dock Committee, and we venture to predict incalculable benefits to the port of Liverpool during the coming winter, when the several lights spoken of shall be in active operation. —*Liverpool Courier.*

ANCHOR TRIALS.—SUPPLEMENTARY TEST OF CANTING PROPERTIES.

A short though interesting experiment was made on Wednesday on the parade ground of the Dockyard, in the presence of Commodore the Hon. Montagu Stopford, Captain Superintendent C. Hope, Captain Mundy, of the *London*, 90, Commander H. Pryce, of the *Monarch*, 84, Mr. Aylen, Master-Attendant, and several of the officers of the ships in port, for the purpose of ascertaining the canting properties of the several anchors. The whole of them, eight in number, were placed in a line on their stock end, and a 36 fathom length of chain was successively bent on to each, with tackle and running gear attached to it. Upon this a party of marines hove smartly until the anchors canted into biting positions. In this instance the American anchor achieved a triumph, turning over immediately the strain was applied. The distances dragged by each of the others before canting were very trifling. Aylen's was drawn 22 inches, which was the greatest of any. In this respect, therefore, there is comparatively little difference between them. The officers present evidently evinced much interest in these important experiments, from which much practical information of the present state of the anchor art may be gained.

A general meeting of the members of the Committee will be holden at the Dockyard on Monday, the 13th inst., at 9 A.M., to take into consideration some important matters then to be brought under notice, and to select those anchors which have proved the most efficient during the previous trials for further testing at the Nore and elsewhere.

ALLEGED PIRACY OF A PATENT.

Edgar Breffit *v.* James Winterbottom.

Liverpool Summer Assizes. — August 24, 1852.

The action was brought to recover damage, for the alleged infringement of a patent.

Mr. Attorney-General Knowles, Mr. Serjeant Wilkins, and Mr. Hindmarsh, were counsel for the plaintiff; and Mr. Watson, Q.C., Mr. Hill, Q.C., and Mr. Manisty, for the defendant.

The Attorney-General briefly stated the case to the jury. This was an action in which the plaintiff complained of the infringement of a patent, the invention of a person of the name of Stocker, in May, 1846. Soon after that period the inventor assigned his interest in the patent for 500*l.* to the plaintiff and a person of the name of Walker, his partner, carrying on business as the Aire and Calder Bottle Company. The defendant was also a partner in that firm, but he had no interest in the purchase of the patent. In 1850, on a dissolution of partnership, the invention was valued to the plaintiff, whilst the defendant soon after established another glass bottle company at Castleford, Yorkshire, and at these works the infringement of the patent was alleged to have been carried on. The invention was intended to answer two objects—an improvement in the manufacture of glass bottles and other similar vessels, and also a stopper of a pecular kind to fix in the same. It is well known that the usual stopper was made of cork, but this had many disadvantages. It communicated sometimes its taste to the liquor, and was, besides, porous, and could not be made completely impervious to the air; and to remedy this the plaintiff used a glass stopper in a peculiar way. In the first place the bottle was prepared, and there was a shoulder, called an annular recess, formed in the neck of the bottle, which prevented a rim of cork or gutta percha from falling down. Within the rim a glass stopper or cork was inserted, so that the liquor never reached the cork, and the bottle was thus made air-tight. On either side of the bottle, as well as across the stopper, was a groove, so that it could be securely fastened down by a piece of wire. The defendant made but a variable alteration in the improved stopper which he had registered, and which caused the present inquiry. Instead of placing the shoulder or annular recess in the neck of the bottle, he transferred it to the stopper, with a collar of cork or gutta percha around it, which answered precisely the same purpose as the plan adopted by the plaintiff.

The defence set up was that the invention was by no means a new one, and after hearing the contradictory evidence of many witnesses, the jury found for the defendant.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING SEPTEMBER 9, 1852.

JOSEPH DENTON, of Rochdale, gentleman. *For improvements in machinery or apparatus for manufacturing looped, terry, or other similar fabrics.* (N.B. This patent being opposed at the Great Seal was not sealed till the 12th March, but bears date the 23rd February, 1852, by order of the Lord Chancellor.)

The object of Mr. Denton's improved apparatus (which may be applied to looms of ordinary construction), is to enable pile or terry loops to be raised on woven fabrics without the aid of wires. The apparatus consists of a narrow flat table, which extends across the loom opposite to, and parallel with the breast beam. Above this table, and parallel with it, is a blade of metal, attached to levers actuated from the tappet shaft and having a horizontal motion in unison with the table, as well as a vertical motion independent of it. The table and blade are not in constant action, but only at intervals, when the pile is to be raised, and then they are caused to act on the warp threads, which they hold with a crimping or pinching action, while the shoots of weft necessary for binding the pile are thrown in, after which the table retires to the shed and the lathe beats up, and then returns to its former position, the table and blade also moving away in an opposite direction to be ready for coming again into operation. The patentee applies also an additional warp thread to give thickness to the terry or pile.

Claim.—Those parts of the machinery or apparatus described for the better and more effectual raising of the pile or terry loops on certain fabrics, by the crimping or pinching action of the table, bar, and levers in combination with the apparatus described.

HENRY BESSEMER, of Baxter House, Old St. Pancras-road. *For improvements in expressing saccharine fluids, and in the manufacture, refining, and treating of sugar.* Patent dated February 24, 1852.

Claims.—1. Constructing the crank or eccentric shafts of cane-presses so that the plungers actuated by them may be each brought into successive operation.

2. A peculiar construction of cane-pressing tube.

3. The direct action of the plungers of cane-presses, by connecting one end of them to the crank or eccentric shaft.

4. A method of guiding and giving a parallel motion to the plungers of cane presses.

5. A peculiar construction of double-acting cane-press.

6. The use of wrought iron tension rods in the construction of cane-presses.

7. A mode of constructing clarifiers.

8. The use of glass in the construction of subsiding vessels used in the clarification of saccharine fluids.

9. The forcing of heated air in contact with saccharine fluids, taken up upon revolving or moving surfaces partly immersed therein.

10. The evaporation of the aqueous portions of saccharine fluids by the joint action of heating media below 212° Fahr., used in combination with currents of hot or cold air brought in contact with such fluids in the surfaces of apparatus revolving or moving partly immersed therein.

11. The use of a jacket or double bottom to pans, as a means of heating saccharine fluids by steam, when used in combination with currents of heated air brought in contact with such fluids in the surfaces of apparatus revolving or moving partly immersed therein.

12. The use of a spiral blade or screw for scraping off or preventing the accumulation of solid matter at the bottom of pans or vessels used in the concentration of saccharine fluids, and also for the purpose of exposing a large surface of fluid, in order to facilitate its evaporation.

13. The forcing of air through a central air pipe or drum in apparatus revolving or moving partly immersed in the fluid to be evaporated.

14. The use of large hollow axes for the purpose of increasing the firmness or rigidity of screws or series of discs used in the concentration of saccharine fluids.

15. The evaporation of the aqueous portions of saccharine fluids by forcing heated air in contact with such fluids or surfaces which move into and out of the fluid to be evaporated.

16. The evaporation of the aqueous portions of saccharine fluids by forcing heated air in contact with thin films or coatings of such fluids on fixed surfaces not heated by any other means.

17. A method of rapidly heating concentrated syrups.

18. A peculiar mode of constructing coolers or crystallising vessels.

19. The separation of fluid matters or molasses from crystals of sugar by continuously spreading the same on a table covered with a pervious material, such table being hollow, and having a partial vacuum formed therein, for the purpose of effecting such separation.

Russell Sturgis, of Bishopsgate-street, merchant. *For improvements in weaving looms.* Patent dated February 25, 1852.

This invention consists of a peculiar arrangement of the part of a loom for weaving bags, sacks, mattress-ticks, and other similar articles in a complete state, without seams, and at a continuous operation.

No claims.

John Elce, of Manchester, machinist, and John Bond, of Burnley, machinist. *For certain improvements in machinery for preparing cotton and other fibrous substances, also in machinery or apparatus applicable to looms for weaving, and the tools employed therein.* Patent dated February 26, 1852.

The patentees describe and claim—

1. A peculiar combination of arrangements for stopping the delivery of the sliver for roving in drawing-machinery when any required weight or quantity of the same has been produced.

2. A self-acting temple for looms, composed of two or more rollers the surfaces of which have rowels or projecting points formed thereon, and are provided with guards or shells capable of being adjusted with reference to the rowels or projecting points.

3. A means of holding the rollers firmly while the rowels or projecting teeth are being formed; and certain tools by which the rowels are formed and brought to a smooth and finished state.

Charles John Mare, of Blackwall. *For improvements in constructing iron ships or vessels and steam boilers.* Patent dated February 27, 1852.

The object of Mr. Mare's improvements is, to enable the required form of plates for ship-building and the position of the bolt or rivet-holes therein to be ascertained without the loss of time and expenditure of labour incurred when the plates have to be hoisted up against a ship's side for this purpose. And this he effects by means of an adjustable frame or apparatus, having sliding bars perforated with holes, and capable of being shifted with respect to each other, and then clamped together so as to retain their relative positions. The dimensions of the plate and position of the rivet holes having been ascertained, and the sliding bars set, the frame is laid on a piece of boiler plate, and the measurements transferred to it, after which the plate is cut, and the holes punched in the usual manner.

Claim.—The mode of arranging and combining apparatus to be used as templates to obtain the required form of the plates (and the position of the various holes therein) employed in the construction of iron ships or vessels and steam boilers.

Charles Reeves, junior, of Birmingham, manufacturer. *For certain improve-*

ments in the manufacture of bayonets, swords, and other cutting instruments. Patent dated February 27, 1852.

These improvements consist in manufacturing bayonets, swords, scythes, knives, and matchets, by rolling pieces of steel, or a mixture of steel and iron, between rollers, having grooves suitably formed to produce the exact shape of blade required. The several kinds of cutting instruments thus produced are subsequently finished in the usual manner.

Claim.—The methods described of forming, or partly forming bayonets, swords, knives, and scythes; that is to say, by first rolling bars of iron or steel into convenient forms, and cutting the same into pieces, and afterwards completing, or nearly completing, the form of the said bayonets, swords, knives, and scythes, by passing the said pieces through rolls, tapered or otherwise suitably formed. Also, the use of iron or steel, or mixture of iron and steel, of a peculiar form (concave at the back edge) for the manufacture of the blades of matchets.

WEEKLY LIST OF NEW ENGLISH PATENTS.

William Henry James, of Great Charlotte-street, Surrey, civil engineer, for improvements in heating and refrigerating, and in apparatus connected therewith. September 3; six months.

Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury, for improvements in producing gas, and in its application to heat and light. (A communication.) September 7; six months.

John James, of Leadenhall-street, London, manufacturer, for certain improvements in weighing machines and weighing cranes. September 9; six months.

LIST OF IRISH PATENTS FROM THE 18TH OF JULY TO THE 18TH OF AUGUST, 1852.

James Pilling, of Rochdale, Lancaster, for certain improvements in looms for weaving. August 20.

Edmund Morewood, of Endfield, Middlesex, and George Rogers, of the same place, gentlemen, for improvements in the manufacture of metals, and in coating or covering metals. August 5.

Ralph Errington Ridley, of Hexham, Northumberland, tanner, for improvements in cutting and reaping machines. August 5.

George Laycock, late of Albany, United States of America, dyer, but now of Doncaster, York, tanner, for improvements in unharing and tanning skins. August 6.

James Warren, of Montague-terrace, Mile End-road, gentleman, for improvements applicable to railways and railway carriages, and improvements in paving, applicable to bridges and flooring. Aug. 17.

Francis Joseph Beltzung, of Paris, engineer, for improvements in the manufacture of bottles and jars, of glass, clay, gutta percha, or other plastic materials, and stoppers for the same, and in machinery for pressing and moulding the said materials. August 17.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Sept. 2	3363	J. Blackwood and Co...	Long-acre..............................	Tablet diary.
,,	3364	Deane, Dray and Co.....	London Bridge......................	Gas stove.
4	3365	J. Higgins..................	Oldham	Hollow furnace door-frame for steam boilers.
6	3366	W. Estwick	Hoxton..................................	Ventilating tent.
,,	3367	R. Grundy	Rio de Janeiro.......................	Boat crane.
8	3368	T. Young	Little Todrig, Scotland	Traction apparatus for horse thrashing machines.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Sept. 7	463	D. S. Brown.............	Old Kent-road......................	Ship.
8	464	W. Howard	Maze Pond......	Ash-pan fender.

CONTENTS OF THIS NUMBER.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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Edited by J. C. Robertson, 166, Fleet-street.

MAUDSLAY'S PATENT ROTARY ENGINES AND PUMPS.

Fig. 1.

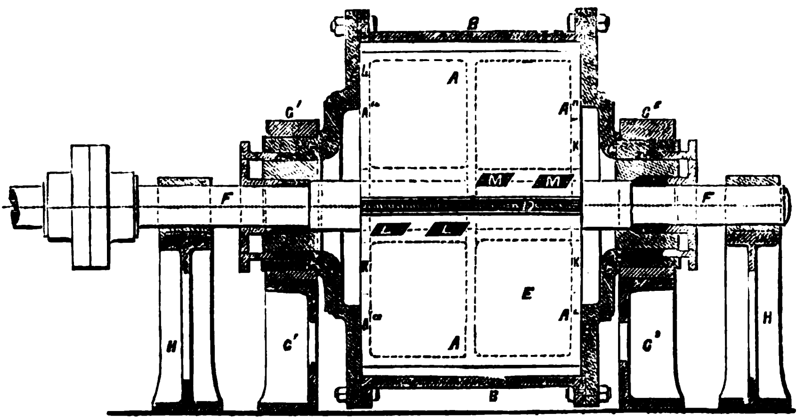
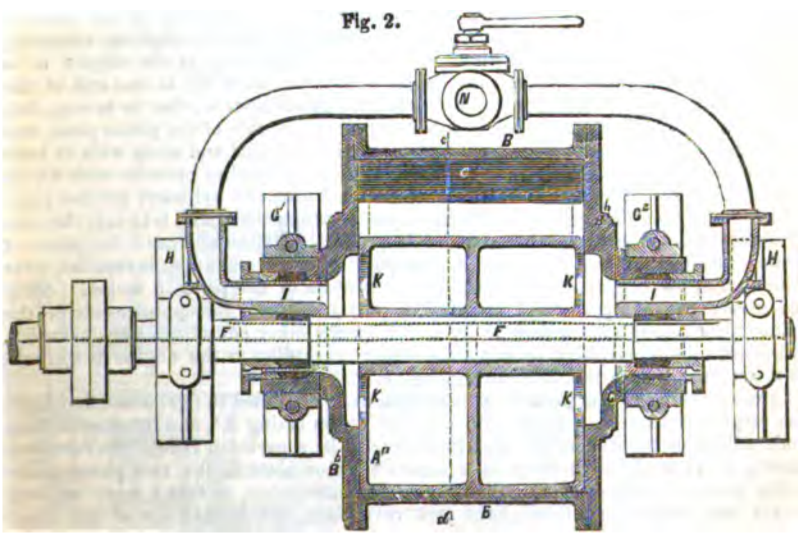


Fig. 2.



MAUDSLAY'S PATENT ROTARY ENGINES AND PUMPS.

(Patent dated January 26, 1852. Patentee, Mr. Joseph Maudslay, of the firm of Maudslay, Sons and Field, of Lambeth, engineers. Specification enrolled July 26, 1852.)

Specification.

My invention in so far as regards steam engines, has relation to that class of engines commonly called "Rotary Engines," because of the rotary motion thereof being produced by the direct application of the force of steam, and consists of an improved arrangement of parts for the purpose, represented in figs. 1, 2, 3, and 4. Fig. 1 being a longitudinal section of an engine constructed according to said arrangement; fig. 2, a plan thereof in section; fig. 3, an end view; and fig. 4, a cross section on the line *c, d.* A B, are two cylinders of different diameters, the lesser of which is designed to revolve within the larger one, but eccentrically in regard to it, so that the outside of the smaller cylinder shall throughout its entire length and circumference come in contact with the inside of the larger one as they revolve together, but only a portion, or line lengthways of the cylinder being in contact at the same moment. C is a piston plate, which projects from the inside of the larger cylinder, and as that cylinder revolves, moves in and out of a recess D, formed in the side of the inner cylinder A. The ends A^a, and B^b, of both the cylinders are turned truly, and fit exactly the one into the other. The larger one has a hollow trunnion formed on each end, and the two trunnions revolve on fixed bearings G^1 G^2, which are provided with set screws for exactly adjusting the position of the cylinders in relation to each other. F is a spindle or axis, which carries the smaller cylinder A, passing right through the centre of it, and also through the hollow trunnions G^3 G^4, and resting at its extremities in the bearings H H. The two sets of bearings, G^1 G^2, and H H, are parallel to, but not in the same line with one another, and the hollows of the trunnions of the large cylinder are of such a size as to allow the axle of the smaller one to pass clear through them in its eccentric position. I I, are boxes which contain the packing for the axles, and also serve as passages for conveying the steam to and through the trunnions. K K are openings made in the end of the small cylinder, through which the steam is admitted into the interior of that cylinder. L L are passages for the admission of steam behind, or on one side of the piston plate, and M M are passages for the escape of the steam on the opposite side, or from in front of the plate. N is a four-way cock for starting, stopping, regulating and reversing the engine. The mode of operation of the engine is as follows: steam is passed through the hollow axis or trunnion G^4, at one end of the large cylinder into the interior space between the two cylinders; that is to say, into the space, which for the time being, is behind, or on one side of the piston plate, and this steam pressing against the piston plate, carries it round and along with it both the larger cylinder to which it is attached, as also the smaller cylinder with which it is interlocked (by means of the piston plate). As the two cylinders revolve together the piston gradually loses its effective area of propulsion; that is to say, the area of piston exposed between the cylinder is gradually diminished until the point of contact between the two cylinders, or dead point of each revolution, is reached, over which point the engine is carried by the momentum of the parts in action. After the steam has thus performed its office, it passes off from the opposite side of the piston plate through the hollow trunnion G^3, on the other end of the large cylinder, either into the atmosphere or into a condenser, according as the engine is worked, as a condensing or a non-condensing engine.

A modification of the preceding arrangement is exhibited in figs. 5 and 6. Here the larger cylinder A, is made with an outer steam casing A^1, and fitted with false ends adjustible by set screws; and it is divided by a partition D into two compartments, to each of which there is a separate piston-plate E, the two piston-plates being placed in opposite positions in regard to each other, so that a more uniform power may be obtained throughout each revolution, and instead also of one inner cylinder, two (D^1 and F^1) are here employed, one of which is keyed on to the spindle F, while the other is left loose upon it, and so at liberty to adapt itself to the varying position of the piston. In this modification the steam may be admitted at

Fig. 3.

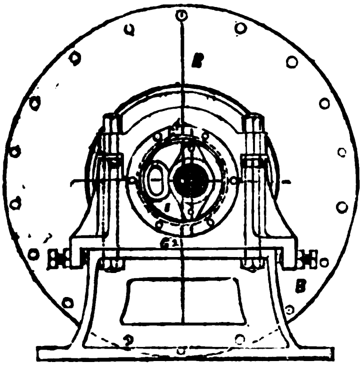


Fig. 4.

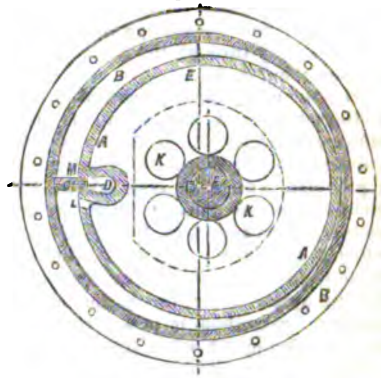


Fig. 5.

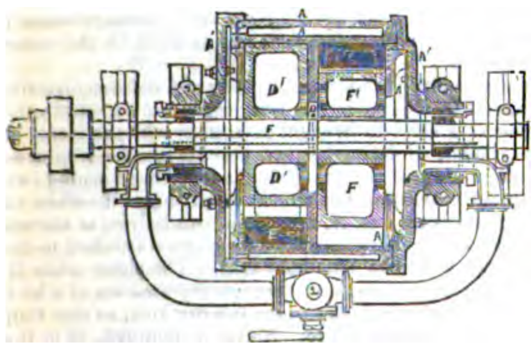
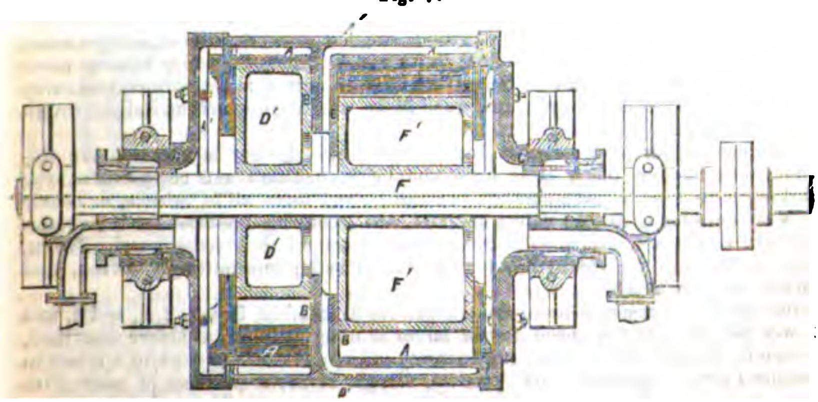


Fig. 6.

Fig. 7.



one trunnion, and be conveyed through the outer casing formed round the larger of the two cylinders, into the space behind the piston plate, or plates, and conveyed thence through the smaller cylinder to the other trunnion; or the motion of the engine may be reversed by causing the steam to enter through the smaller cylinder, and pass away through the outer easing of the larger one; L is a four-way starting and reversing cock.

Another modification is shown in fig. 7, which it will be proper to adopt when it is desired to work, the engine on the continuous expansion principle. The outer and larger cylinder A, is made, as in figs. 5 and 6, with an outer casing A^1, which is divided by partitions B B, into two compartments of different sizes, each of which is provided with a separate piston-plate; the two piston-plates being placed in opposite positions to each other. In this arrangement, also, as in figs. 5 and 6, there are two inner cylinders, D^1 and F^1, of different sizes, the larger one of which, F^1, is keyed fast to the spindle F, and the other left loose. The steam is admitted through the trunnion G, and apertures H H, into the outer casing A^1, and thence into the space behind the piston-plate of the smaller compartment of the larger cylinder, from which it passes through the interior of the small cylinder D^1 into the outer casing A^1, when it enters the space behind the piston of the large compartment, where it acts on the piston by its expansive force, after which it is allowed to pass off through the interior of the inner cylinder F^1, and the trunnion G, either to the condenser or to the atmosphere.

A fourth modification is shown in figs. 8 and 9. A is an annular cylinder which is mounted on a spindle, or axis C, which revolves in fixed bearings D D. Within the annular space is a ring E, with a groove or opening cut in it, through which a piston-plate or plates B passes, which piston-plate or plates is fixed to the outer and inner ring of the annular cylinder.

The ring E revolves on its own centre in bearings, which are fixed eccentrically in regard to the other bearings D D, so that as the one ring revolves within the other, the outside of the interior ring shall be brought in contact with the inside of the outer ring of the annular cylinder, whilst at the same time its interior is in contact with the outside of the smaller ring of the annular cylinder; thus forming two lines of contact between the annular cylinder and the internal ring. To allow of the insertion of the interior ring, the large one, A, is made in two halves, as shown. The smaller ring E, has a circular flange P, by means of which it is attached to the outer casings F F, which are carried by hollow trunnions G G. The piston-plate B, forms the barrier against which the steam acts, and through the medium of which motion is communicated from the annular cylinder to the interior ring, so that they shall revolve together, but each on its own centre. Steam is admitted, as in the arrangements previously described, through one of the trunnions, and the holes *k k*, to the back of the piston-plate, and escapes from before the piston-plate through the other trunnion and holes shown by dotted lines *l l*. The steam passes from one side of the annular flange P, to the other, through the holes *i i*. Instead of the annular cylinder being fixed in a spindle (as in the arrangement just described), and the internal ring being carried by an outer casing with hollow trunnions, it may in some cases be found more advantageous to form the hollow trunnions in the former, and carry the latter on a circular flange or boss fixed in an axle passing eccentrically through the trunnions.

The different forms of steam engine before described, offer in common the following advantages: *First*, their great simplicity, lightness and compactness, the working parts being in each case few in number, and these all in balance, or nearly so, and there being neither valves or slides, nor eccentrics required for the admission and emission of steam. *Second*, the directness of their action; and, *Third*, the great velocity at which they are capable of being intermittingly driven, and without noise or shock.

Instead of the piston plate in the engine, represented in figs. 1, 2, 3, and 4, and its modification being attached to the larger or outer cylinder, as before described, it may be attached to the smaller or inner cylinder, and made to work in a recess in the outer one. I prefer to use cylinders, though cones, or portions of cones with the axles so placed as to bring their surfaces in contact, might be employed.

So also, instead of the spindle of the smaller cylinder being employed as the driving shaft, the motion may be taken from a toothed wheel and gearing attached to the outer or larger cylinder.

Fig. 8.

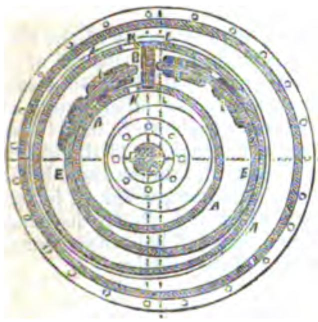


Fig. 10.

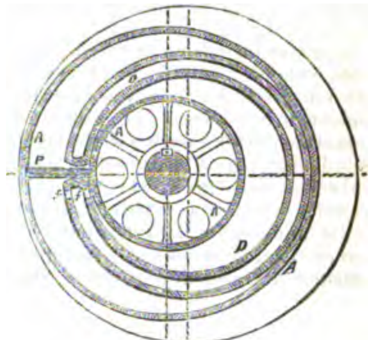


Fig. 11.

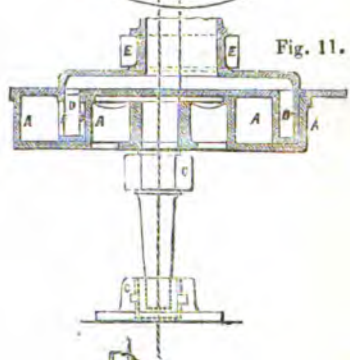


Fig. 9.

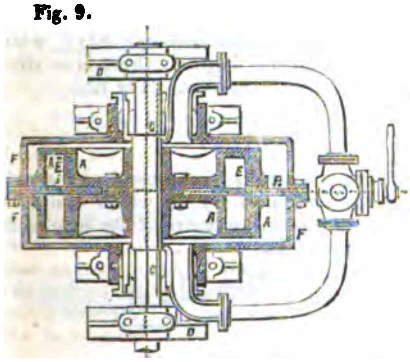


Fig. 12.

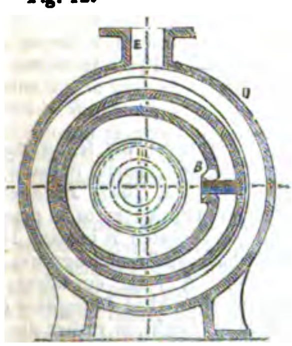
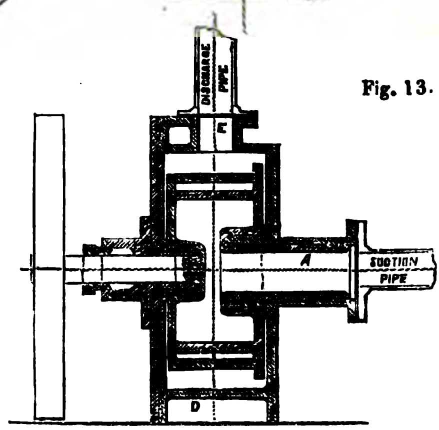


Fig. 13.



Any other elastic or non-elastic fluid may be used for working these engines as well as steam. An arrangement which would be particularly suitable for being driven by water, is represented in figs. 10 and 11. A is an annular cylinder open at one end, which has a piston-plate P fitted into it, and revolves on its centre in fixed bearings C C. D is an internal ring, made hollow to form a channel for conveying the water to the back of the piston-plate, and which has its centre or axis

formed by a hollow trunnion revolving in the bearing E, which is fixed eccentrically to the bearings C C. The annular cylinder has at top a circular flange, or disc, which must be sufficiently large to allow for the change of position, as the two parts revolve together. Water is admitted down the hollow trunnion and through the passages $f\,f$, into the space behind the piston, and it is allowed to escape from before the piston, through the passages $g\,g$, in the annular cylinder.

As pumps for raising or forcing water or other fluid, engines on any of the plans which have been described will be found especially useful, as in consequence of the high velocity of which they are capable and their continuous rotatory action, a small machine may suffice to discharge a large quantity of water or other fluid. An arrangement of the engine well adapted for pumping water is shown in figs. 12 and 13. The axis A is made hollow, and the water admitted through it to the interior of the smaller cylinder, whence it passes through a passage B, into the space behind the piston-plate, from which space it is discharged through the passage C, in front of the piston-plate into the outer casing D, from which it is finally discharged through the delivery-pipe E. As blowing machines too, they will have the advantage of maintaining a great pressure of blast with a regular and easy motion.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—In the solution of the question respecting the *Exciseman's Staff*, which you printed in No. 1514, pp. 121-126, of your valuable Journal, there is a slight inadvertence which I hope you will do me the favour to correct. The line

$$DQ = Z = r - \frac{r^2 \tan \beta}{4(l-m)}, \text{ instead of } \frac{r^2 \tan. \beta}{4(l-m)},$$

in p. 126. This omission arose in transcribing the results of the centre of gravity of the part immersed from the pages of the *Lady's Diary*, in which I did not observe at the time the origin of co-ordinates to be in the centre of the base of the cylinder. If this correction be made, then we shall have,

$$W = D\pi r^2 \frac{(2n+m+2r\cot.\beta)(l-m) - \frac{r^2}{2}\left(\frac{\tan.^2\beta}{2}+1\right)}{2n+2r\cot.\beta}$$

When n is equal to $\frac{l}{2}$, then we shall have

$$W = D\pi r^2 \frac{(l+m+2r\cot.\beta)(l-m) - \frac{r^2}{2}\left(\frac{\tan.^2\beta}{2}+1\right)}{l+2r\cot.\beta}$$

which agrees with Mr. Tebay's and Indagator's formulæ, No. 1517, pages 183, 187.

I shall not make any attempt to prove the truth of the equation

$$\mu\,(W-F)\ \sin.\beta + F\cos.\beta = W\cos.\beta,$$

which Mr. Smith has laboured to show (*without success*) to be absurd.

Mr. Smith has characterized my production as being extremely servile; in answer to this charge I can only say, that such was certainly not my intention in writing it.

I hope never to forget, *though a workman*, to be gentlemanly, even in pointing out the errors of my fellow men,—good breeding and charity demand it.

In page 184, No. 1517, *Indagator* has charged me with an error in principle, and he has repeated it in page 189, under somewhat painful and aggravated circumstances. A little consideration will suffice to show that *Indagator* has committed an oversight, or rather drawn a hasty conclusion in this matter.

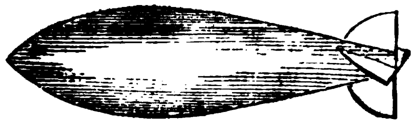
My opinion, however, of the mathematical powers of *Indagator* leads me to believe he will not be slow to correct the statements he has made.

WORKMAN.

Sept. 14, 1852.

SPHERICAL AND CONICAL SHOT.

Sir,—Habit and custom so reconcile us to the most absurd practices, that we cease to wonder at the tenacity with which mankind cling to whatever has once become established among them. To this influence we may partly attribute the continued use of spherical balls in gunnery, for certainly it is not warranted by any analogy in Nature. Who, for instance, ever heard of a *round* fish, or a round bird, or, in short, of a spherical body of any kind, that was intended to move with great velocity through a resisting medium? On this ground, as well as on the score of policy in keeping pace with our neighbours in the introduction of improvements in gunnery, I take this opportunity of laying before your readers an invention of my own, hoping it may merit the attention of the Board of Ordnance. It is an *elongated projectile*, equally well adapted for solid balls or for hollow shells. A short description of it, accompanied by a sketch, will make its nature easily understood.



Its form approximates to what is known as a *solid of the least resistance*, as far as the forepart is concerned. The hinder part is tapered off something like the hinder part of a fish, having at the end a fish's tail, or rather two tails, which form a cross of the same size as the diameter of the thickest part; this cruciform tail serves to steady it while in the barrel of the gun—a very important point, considering the form of the missile. The four vanes, which constitute the tail, are set obliquely in the manner of a screw, to give it a spinning motion like a rifle, but with the great advantage of not requiring grooves in the gun. The screw tail answering the same purpose as the *feathering* of an arrow, I am disposed to think that the application of this projectile to the various purposes for which it is adapted would render our artillery frightfully effective, and perhaps make our old muskets a match for the Minie rifle

I am, Sir, respectfully yours,

URIAH CLARKE.

Leicester, September, 1, 1852.

MESSRS. ARMAN AND CO.'S PATENT SYSTEM OF NAVAL CONSTRUCTION.*

The appearance of this pamphlet, and the information it contains, affords us a suitable opportunity for recurring, more at length, to the important subject it discusses, which we noticed briefly in our Number of the 7th August (*ante*, p. 116.) The progress of the naval arts during the last half century has presented many points at which it might have been supposed improvement must stop. When Symington, despite predictions, succeeded in breasting the tides of the Clyde, and showed that locomotion by water could be rendered to an unexpected degree independent of "skyey influences," it was thought a great thing that so much could be done for inshore navigation; but no hope was entertained that the outward surging sea would ever be mastered.

When the narrow seas were crossed, it was barely hoped that some favourable corner of the ocean might be attempted. Spain being reached, and the Mediterranean being traversed longitudinally by stages, some priests of science, misdoubting the oracle, declared that the Atlantic could never be crossed by steam. America, however, was attained; and now the emulation of nations renders the voyage across the Atlantic a struggle for a few more or less of hours. Not even now content, India is to be reached at one steam voyage round the Cape, stopping nowhere even for coals.

Whether this last bold design be or be not achieved, it is equally worthy of remark that Mr. Brunel, its proposer, bases it on no novelty of invention, but only on a careful application and combination of all that has yet been found most successful—that is, the present advanced condition of marine locomotion is a whole made up of individual improvements. It is the result of continual elaboration, not

* Remarks on the combination of timber and iron framings in the building of ships, recently constructed by Messrs. L. Arman and Co., of Bordeaux, on a plan recently adopted for trial by the French Government.

of one mighty step,—of pains-taking working out of the original principles, of savings of weight or additions of efficiency, small, perhaps, one by one, but ever accumulating to the accomplishment of what has seemed at each point the impossible next step. If we ever go to India by steam at one voyage, it will be because item by item every part of the wonderful means has been perfected, and it only remains to bring the whole of the perfected parts together. But even this, it is easy now to see, is only another point in the path of progress. To go even to India at one voyage may be better or worse done; if done at all, it may be a vast step gained to vast interests; to be well and cheaply done, may be a great deal more.

If we are not much mistaken, the present is a considerable stride in this general progress; and the want of some such device has been much felt in relation to sea-going steamers intended for speed. For speed requires sharpness of the bows; sharpness requires length; length in timber vessels involves weakness from the nature of the materials, the multiplicity of the parts, and the magnitude of the strain occasioned by the enlarged dimensions of the structure, and by the varying action of the waves on the surface of so great a body. If the timbers be duly increased to support the increased strain on them, then the weight of the whole absorbs too great a proportion of the floating power which should be derived from the exterior immersed bulk of the vessel. These considerations are all aggravated in the case of steamers, the weight of whose machinery and the application of whose propelling power strain their framing chiefly at a few particular points, instead of being diffused over the whole more equally from many points, as in sailing ships. Timber ships, therefore, have limits to their dimensions, particularly for purposes of steam navigation—which limits, if not absolutely impassable, cannot be approached without great increase of difficulty, expense, and risk.

These facts led to the use of iron ships; and a vessel entirely of that material is lighter, stronger, and speedier for the same external bulk than one of wood. But iron has also its disadvantages. In warm climates it soon becomes foul from incrustations; in some seas it is rapidly changed, when it is immersed, into a soft, weak substance, on which it is wholly unfitting to risk property and life. And although this metal resists or submits to some kinds of accidents with less injury than wood, yet it can be subjected to others only to be injured beyond retrieval. A shot passing through an iron vessel often tears off whole plates, which cannot be replaced at sea; and the same irreparable damage may be done by striking on a rock, to the instant destruction of the whole. The injury to a wooden vessel in many such cases has been met with temporizing expedients, and the catastrophe averted. Iron, if the most manageable of materials where appliances exist, is perhaps the most difficult to deal with under hasty and unprovided emergencies. Wood is then commonly far readier to manage, and its derangements under such circumstances are much more easily rectified.

These remarks apply to ships wholly of wood or wholly of iron, and to one or other of these classes nearly all existing ships belong. Some attempts indeed have been made to use iron in aid of wood, but, before the present invention, we believe, no system has been adopted into which both wood and iron enter as essential parts, each in the place suitable to its own nature.

When a new material or operation is proposed, its friends commonly carry their advocacy to extreme lengths. *Rien de trop* is no maxim for them. Their novelty soon has given to it the unreasoning tenacity of a dogma; and "nothing like leather," is scarcely an exaggerated type of the zealous but shallow reasonings with which its use on all imaginable occasions is enforced. In their turn, stone, bronze, wood, iron, caoutchouc, gutta percha, and many substances less really valuable than they, have been avowed capable of supplying every mechanical want of men. So ships were entirely of wood until they were made entirely of iron. It seemed too sober to ask whether in so complicated a structure, some parts would not be better of one material, and some of the other. Messrs. Arman asked themselves that question, and they answer it as follows:—In its outer part—in that which comes in contact with the water—their vessel of wood. This is sustained

by a wood framing, much lighter than that employed in wooden ships of equal size. Inside of this wood framing, securely fastened to and incorporated with it, is an iron framing that supplies the strength and stiffness which the weak and light timber frame alone would have wanted. We refer to the details of construction to the extract from the report of M. Sabattier to the French Minister of Marine, which we give at the close. The advantages gained appear to be as follows:

The peculiar disadvantages of iron vessels are avoided. The wooden exterior is not so liable either to decay in many seas, or to irreparable disaster from violence, as is a covering of iron-plates; nor would it be so difficult to repair temporarily, either the wooden surface or its immediate wooden support, as to restore a purely iron structure under the same circumstances. The iron frame, however, in which strength (as distinguished from integrity of structure) depends, and which would be the most unmanageable part of the whole to repair at sea, is sheltered from most chances of injury by the more appropriate wooden outside.

The arrangements permit the greater part of the outside planking, and other wooden parts of the ship, to be seen, reached, and to some extent repaired from the inside. A leak may thus be found and remedied with facility.

A vessel of this construction may be made to have all the advantages of an iron one as to strength, lightness, and economy, concurrently with length and large dimensions generally. The iron frame brings with it much of the speciality of vessels entirely of iron; though in the employment of it there is no natural limit to the magnitude of the pieces employed, nor to their form. Neither scarcity of appropriate crooked timber, nor the necessity of wasteful conversion, nor difficulty of junction, nor multiplicity of pieces and joints, affect this essential part of the structure; so far (and this is very far) the ship is an iron ship. The reduced scantling of the timber frame retained avoids much of the cost and difficulty of a purely wooden vessel, while the main dependence for *strength* being on the metallic portion, so much of the old wooden structure as is retained to serve other purposes may be varied in its construction so as best to answer those purposes.

It adds much to the practical value of these advantages that they are associated with the obtaining of a lighter hull for the same total displacement. If we assign any given bulk of immersion to a ship, it is obvious that so much of that bulk of immersion as is required by the weight of the hull itself, is just so much deducted from the profitable floating power of the machine; a deduction unavoidable in nature, and to be reduced in quantity, as far as science may show, it can be done. The difference between a heavy hull and a light one is just so much taken from the freight-bearing power, and, therefore, from the paying power of the former, if in other respects the ships are equal. It is certified of M. Arman's invention that it produces much lighter ships than wooden ones with equal strength. A large French steamer, the *Gower*, was thought to be very favourably constructed, when the weight of the hull was 43 per cent. of her total displacement. In the new plan it is officially asserted that this weight has been reduced to 35 and even to 30 per cent.—a difference of nearly one-fifth of the cargo bearing capability of a vessel, if the system will generally effect it.

On this plan Messrs. Armans have built, and are building, several vessels. The first of them, the *General Castilla*, was a steamer of 120-horse power, which, under the name the *Cazador*, has proved very successful in the service of the government of Chili. The French Government directed an official examination of the plan, and have begun to adopt it, and we understand arrangements have been made for the employment of the invention on a large scale in England. The details given in the pamphlet will show the progress the system has already made.

The following is the description of the details given by M. Sabattier, in his Report to the French Minister of Marine:

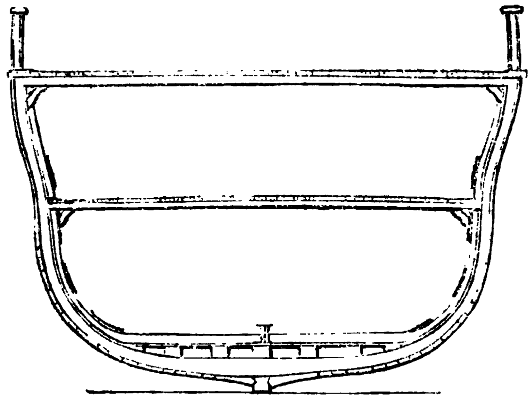
The hull of this vessel (*General Castilla*) is lighter than that of any of the mail packets of one hundred and twenty horse power, having the same dimensions; and Mr. Arman has certainly succeeded by his combi-

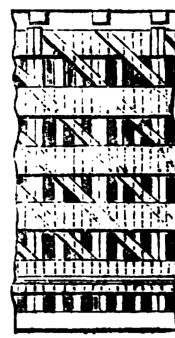
nation of wood and iron framings, in making it much more rigid and solid.

The draught here annexed will explain clearly the system adopted by this gentleman; and a few explanations of the mode of construction of the said vessel will show all the advantages of his plan.

The timbers of packets for one hundred and twenty horse power are, for the floors, moulded 6½ inches, and 8½ sided; and 4 × 6 inches at the gunwale.

Mr. Arman has reduced the scantling of these frames to 4½ inches, from the floor timber to the gunwale.





The distance between the timbers is 6½ inches, and he introduces alternately a pair of ribs, and then two single ribs.

When his timber frame is formed, he brings in his filling-in pieces for the bottom, bolts the frame with the keel, and substitutes for the wooden kelson an iron kelson of 13 inches high, and nearly half an inch thick.

This kelson is fastened to the timbers by rag-bolts, and to the filling in pieces by forelock bolts.

Then beginning about midships, and proceeding fore and aft, he crosses this timber framing by a second framing of 2½ double-angle iron, riveted back to back, in the shape of the letter Z, extending from the under part of the deck to the iron kelson, to which it is fastened, and forming the sides of the iron kelson aforesaid. These iron ribs are fastened by one or two galvanized iron bolts on each timber, which they cross at an angle of about 45°, *and clinched on the outside.*

These iron ribs are 4 feet 7 inches apart, and between and parallel to them, a light wooden piece 2½ × 5½ is made fast on each of the timbers.

Iron shelf-pieces and clamps are substituted for those of wood, and fastened to the framing as done in iron vessels.

The beams are of iron in the engine-room, and of wood towards each end.

The engine-room is separated from the other parts of the vessel by iron bulkheads, fastened to the timber frame by angle-iron.

The stiffness of the vessel is also increased in this part by four iron riders extending from the main beams to the iron bearers; establishing thereby a connection between the different parts, and giving to the whole a great solidity.

The engine and boiler bearers are of plate and angle-iron, fastened on the timber framing *with bolts clinched outside, previously to the fastening on of the outside planking.*

When these framings are properly fastened, as well as the engine-bearers, and the iron riders above mentioned, they proceed with the outside planking, wales, &c., which are copper-bolted on the timber framing only, the bolts being clinched inside, as usual.

When the outside planking is securely fastened, and the whole has been well painted, three longitudinal strakes of plate-iron are riveted on the inside surface of the iron ribs, dividing equally, or nearly so, the distance between the shelf-pieces and the lower floor-heads.

Interstices are left between these plate-iron strakes, which fully expose to view the double framing, which may be kept in order and painted, so as to last longer than usual.

This important point constitutes one of the greatest advantages of Mr. Arman's plan.

The engines are perfectly steady on the iron bearers, and during our trials at sea not the smallest vibration or play could be dis-

covered in any part of this double-framed vessel.

We may therefore say that this plan of building combines all the rigidity and solidity of iron-built vessels with all the advantages of timber-built ships.

Repairs of all sorts will present less difficulties than usual; and should it be necessary at any time to remove any of the iron ribs, coach screws may then be advantageously used in refixing them.

In conclusion we may say, that sea-going vessels built according to Mr. Arman's plan are lighter and stronger, though not dearer, than those built according to the old system. It is therefore most important to the French navy that a trial should be made, and that one of the vessels that are ordered should be built on this plan.

MECHANICAL PROPERTIES OF IRON.

(Abstracts of Papers read before the British Association.)

Report on the Tensile Strength of Wrought Iron Plates, at various Temperatures. By Mr. Fairbairn.

Mr. Fairbairn said, the experiments were not sufficiently advanced to enable him to lay before the section any detailed account of them, in consequence of the apparatus for conducting those experiments having, for the last six months, been pre-occupied for the Royal Society to determine the temperature of fusion or the laws of the solidification of bodies under great pressure. Under these circumstances, it was next to impossible to make much progress with the experiments on the effects of temperature, &c., on wrought-iron plates. Up to the present time, they must therefore be considered preliminary; but, judging results obtained on a former occasion from experiments on bars of iron subjected to a transverse strain at varied degrees of temperature, it is more than probable that some new and interesting facts may be devoloped by those now in progress.

Report on the Mechanical Properties of Metals, as derived from repeated Meltings, exhibiting the maximum Point of Strength, and the Causes of Deterioration. By Mr. Fairbairn.

After some preliminary observations, Mr. Fairbairn stated that, having been requested by the British Association at their last meeting to undertake an inquiry into the mechanical properties of cast-iron, as deduced from repeated meltings, and feeling desirous of ascertaining to what extent it was improved or deteriorated, arrangements were made for conducting a series of experiments, calculated satisfactorily to determine this question, and to supply such data and such information as will enable the engineer and iron-founder to ascertain with greater certainty how far those re-meltings can be carried with safety, or till such time as the maximum of strength is obtained, and such other properties as appear to affect the uses of this valuable and important material. Mr. Fairbairn further stated, in connection with this subject, that it was his intention to investigate another important process, which, to a considerable extent, affects the stability of some of our most important iron constructions—viz., the rate of cooling as it affects the adhesive properties of the material, and the more complete and effective process of crystallization. On these points it is well known that a rapid rate of cooling is invariably attended with risk; that an imperfect crystalline structure is obtained, and that irregular and unequal contractions are not only present, but they are frequently the forerunners of disruption, as well as exceedingly deceptive as regards appearances, or the dangerous consequences which invariably follow in cases of rapid cooling and unequal contraction.

On the Form of Iron for Malleable Iron Beams or Girders. By Mr. T. M. Gladstone.

It is, said Mr. Gladstone, on the application of wrought-iron beams or girders I propose to make some remarks, by contrasting their powers and properties with those of cast-iron; to show what form of iron I conceive best adapted for such use, and to state, as a manufacturer, what may be expected as the capabilities of iron-works to produce the same beyond previous efforts, so as to meet the increased requirements of the times. It is found that, by converting iron from a cast into a malleable state, the adhesion of the fibres of the metal, under tension, becomes increased from 7 to 27, and indeed much beyond that when the best quality of material is manufactured. At the same time, it is stated that the compressive strength is somewhat reduced. In this latter assumption I do not altogether concur from a permanent feature in the experiments not being sufficiently taken into account—namely, that in experimenting with wrought iron, at a given extension, from pressure, it is necessary, before you obtain even a medium value of the resistance, a modicum of deflexion must take place to bring into play each of the fibres; consequently, not like as in a rigid cast beam, where the full action of compression acts at once, some allowance must be made for the change from the first position, in calculating the compressive

forces. Assuming generally that the increased strength of tensive power of wrought compared with cast iron is 27 to 7, it at once reduces the sixfold area of the bottom web of the iron beam, and nearly reduces to one-half the required sectional area throughout, yet retaining an equal strength for every purpose. In many cases this increase of strength, enabling to reduce the weight, will fully compensate for the difference in price, so that up to this point the market and effective value of both may be said to be equal. The wrought-iron beam, however, possesses this material advantage, and that is, it will always give good warning before the point of danger is reached, and this, mainly from its vastly increased deflective power — indeed, before its maximum is reached a great deflection can safely take place; therefore, both for life and property its advantage is most conspicuous. With regard to the best form for carrying the greatest weights with the least metal, I have come to the conclusion, from actual experiment on a large scale, that the double T section is the best, provided the flanges are sufficient to prevent lateral action from the load. At the Belfast Iron-works the members can see iron of the section shown in bars of twenty six feet long, and weighing nearly half a ton, so that it will be seen the mills are now constructed so as to roll iron almost any dimensions which may be required, and such bars, from the breadth of the flanges, have never before been attempted in the three kingdoms. When I had the honour, some four years ago, to read a paper at the Society of Arts on a means of constructing bridges without any centring of such proportions of iron, no ironmaker would attempt to produce such a proportion of material, while now I have accomplished it, and would have no hesitation in making them much larger if required. I have not a doubt for warehouses, mills, public buildings, and bridges, its value will now become extensively applied and appreciated. As these bars are rolled solid throughout, on comparison I have found they will bear nearly one-third more than any made beam of equal sectional area — that is, with a beam of which the centre rib is of plate iron and the flanges of angle iron, and riveted thereto, and so distributed as to make the double T form. This is easily accounted for, as you necessarily weaken the whole by its being requisite to introduce riveting, while a due and equal resistance is offered from all parts by the solidly-rolled bar.

PROPOSED THEORY OF THE ORIGIN OF THE ASTEROIDS. BY MR. J. NASMYTH.

"As the progress of science is frequently aided by advancing hypothetical views in explanation of the cause of certain phenomena, I hazard a suggestion as to the cause of the break-up of the original planet whose fragments, it has been conjectured, form that numerous and remarkable group of small planets revolving between the orbits of Mars and Jupiter; some peculiarities of whose path have led to the supposition that they must have parted company from a parent mass at the same time and place. In order to render my views on this subject more clear, I would refer to the well-known toy called a 'Prince Rupert drop;' namely, a drop of glass which has been let fall, while in a semi-fluid state, into water, by which the surface of the glass drop is caused to cool and consolidate with such rapidity that the subsequent consolidation and *contraction* of the interior mass induces such a high degree of tension between it and the exterior crust, that the slightest vibration is sufficient to overcome the cohesion of the external crust, and by so letting free the state of tension to cause the glass drop to fly into thousands of fragments. Nor is this action confined to 'Rupert's drops;' as we have examples of the same action in our foundry apparatus, in the case of masses of brittle metal, where the exterior of the casting first consolidating (as it always does before the interior), the after contraction of the interior of the mass induces a sort of 'touch and go' state of tension, which frequently results in such castings flying into fragments in spite of their *apparent* strength, either *per se*, or on the application of some force otherwise totally inadequate to produce so destructive a result. Now, let us apply this action (which we find constant in the cooling of all masses of brittle material) to the case of the supposed parent planet of the asteroids. It appears to me that we shall find in such the elements of a very feasible, if not *the true* explanation of the origin of this remarkable and numerous group of planets, — namely, that the parent planet may have consisted of such materials as that, by the rapid passing of its surface from the original molten condition to that of solidification, while the yet fluid or semi-fluid interior went on contracting by the comparatively gradual escape of its heat into space, through the solid crust, a state of tension may thereby have been induced, such as that in the 'Rupert drop,' and that the crust may have at last given way with such violence as to cause the fragments to part company, and so pass off, whirling into orbits, slightly varying from each other, according to corresponding

variations in the condition of each at the instant of rupture. The remarkable fact,—that the orbits of these asteroids have one common node or point of coincidence, causes us to look to some such explanation as I have thus hazarded, and which perhaps may be entitled, meantime, to fill up a gap, until supplanted by a better explanation."

DRAINAGE OF THE LAKE OF HAARLEM APPROACHING COMPLETION.

That interesting island sea, which burst through the dykes of sand and willows, and swallowed up some of the richest meadows of North Holland, more than three centuries ago—has been nearly expelled from the territories on which it had seized in spite of Dutchman and Spaniard. In the year 1539, while the people of the district were groaning under the oppression which afterwards drove them into the insurrection now considered one of the noblest uprising of the world,—the North Sea broke over the artificial dams and the triple ridges of sand formed by the action of wind and tide on that stormy coast, and showed the inhabitants how to isolate their cities and cut off a besieging enemy:—a lesson afterwards turned to effective account by them at Leyden and elsewhere. But the invasion of the water brought horror and desolation into the fertile flats of North Holland. Twenty-six thousand acres of rich pasture land, with meadows, cattle and gardens, were covered by the waves which would not ebb:—and the village of Nieuweinkirk was submerged, and all its inhabitants were lost in the tremendous calamity. More than two centuries elapsed before any one began to dream of recovering this vast estate; and then, although the lake was only six feet in depth, the recovery was long believed to be impracticable. Again and again the project has been started since the present century came in. In 1819, a scheme was submitted to the king for the drainage, and approved—but it led to no result. Even as late as the session of 1838 a motion for the same purpose was rejected by an immense majority in the Dutch House of Representatives. But as the engineering science of the age grew more daring and confident, even Dutch phlegm gave way, and the works were, as our readers are aware, commenced. They have been long in progress—and it is now reported that the task is near its final accomplishment. The remains of the unhappy village of Nieuweinkirk have been found, with a mass of human bones, on the very spot where the old charts of the province fixed its site. In a few more weeks it is believed that the Lake of Haarlem, famous for its fishing and pleasure excursions, will have become mere matter of record.

ORIGIN OF REAPING-MACHINES.

(To the Editor of the *Times*.)

Sir,—In your notice a few days ago of the trial of the rival reaping-machines of Hussey and M'Cormick, at Cirencester, your correspondent remarks that it has never been established whether the reaping-machine is a real Yankee "notion" or a plagiary from the mechanical genius of the mother country. I shall, with your permission, enable you to solve the question.

The reaping-machine is not an American "notion," but owes its existence to Scotland. It has existed in this country and been overlooked for twenty-six years, during which time it has been permitted to cut, year after year, a farmer's crop in the far-famed Carse of Gowrie, neglected by, and even unknown to, the great body of British farmers. A copy was produced from America at the World's Fair, and, after neglect for a quarter of a century, the original machine starts into vigour to establish an independent position for itself, apart from all imitations.

"Bell's reaping machine" was the first of the genus, and is the parent of all the others. In 1826 the idea occurred to the Rev. Mr. Bell, a clergyman of the church of Scotland, who made with his own hands, in the first instance, a sort of model, and then a full-sized machine, which was seen by a very few individuals, and worked for a few hours, after sunset, on his father's farm at Mid Leoch. Mr. Bell afterwards employed David Hill, joiner, at Kirkton of Auchterhouse, to construct a frame for further experiment; ordered a set of cutters, or scissors, from the Monkland Ironworks, and again fitted up another machine, which was publicly exhibited on the farm of Powrie, and also on the farm of the Mains of Ardestie, both in the county of Forfar. The invention having afterwards attracted the notice of the Highland and Agricultural Society, Mr. Bell, about the year 1829, was requested to have one sent to their show at Glasgow. He got one made at the East Foundry, of Dundee, and on its exhibition received from the society a premium of 50*l*.

In 1830 Peter Gibson, smith and machine-maker in Dundee, made one for Alexander Bell, farmer, Mains of Tealing. In 1832 he made one for each of James Thomson, farmer, Findowrie, near Brechin; Colonel Millar, Orquhard, Fifeshire; George

Moodie, farmer, Dunbog, Fifeshire; and Andrew Whitton, farmer, Auchterhouse, Forfarshire. In 1833 he made one for James Robertson, farmer, Reedieleys, Fifeshire; and in 1834 another was made for P. B. Yattes, Madison County, State of New York, America. In 1836 one was made for James Geddes, farmer, in Morayshire, for the Morayshire Agricultural Society; and in 1844 one was sent to the Count de Bombelles, in Austria.

The machines so supplied to Messrs. Bell, Moodie, and Thomson, have been in constant use for a great number of years, and are the same as that which obtained the prize at the late Exhibition of the Highland and Agricultural Society, at their show this month in Perth.

Bell's reaping-machine is the best yet exhibited, and at a trial on Tuesday last, in presence of the most eminent agriculturists of East Lothian, it received unqualified commendation. Those who have seen it are loud in their praise, and a challenge for 50*l*. has been given by Mr. H. Watson, of Keillor, the trial to take place on the farm of Keillor, which is 15 miles east of Perth by the Scottish Midland Junction Railway. We shall see whether Hussey, Croskill, or M'Cormick appear to contest the supremacy with Bell.

From the above narrative you will see that the reaping-machine is a home production, and not the child of our go-a-head cousin. I enclose my card in accordance with your requirement, and am, Sir, your most obedient servant,

A Constant Reader.

Edinburgh, Aug. 28.

MAIN'S PATENT DUPLEX COMPENSATING ENGINE.

Sir,—In looking through your 1494th Number, a few days ago, my attention was particularly struck by engravings and description of what I found to be named Main's Patent "Duplex Compensating Engine;" and, upon an examination, I found it to be one of a large family of ingenious contrivances for producing two revolutions of the crank-shaft by one stroke of the piston. This family has, however, been rather an unfortunate one, as most of its members have partaken more or less of malformations—the most prevalent one being that of knock'd knees and bandy legs, and that to such a degree that none have, I believe, yet passed the doctor. In reading the description given by Mr. Main of the various advantages of this form of engine, I find it to be a repetition of the latter clause of almost all the specifications of engines recommended as *best* for purposes of war, viz., tortoise engine with *bare* screw; absence of friction on the working parts, *especially* in the bearings of the crank-shaft, and serving as first-rate ballast for the ship from its position.

The fourth and fifth items of commendation—that the action of the working portions of this engine is *vertical*, and therefore sure to wear uniformly, and that all the parts are easily accessible when repair or replacement is required—require to be taken with a good deal of qualification.

As to the vertical action little need be said, because a glance at the engravings, and the least knowledge of this kind of engine, would show that there is but little of it—most of the stress on the working parts being eminently *lateral*, and that to so great a degree as to procure a *name* for the family—that of "Bandy-legged."

The best specimen of this kind of motion applied to the propulsion of machinery which has come under my notice, and which I believe to be the best yet invented or designed, may be seen, in model, on board H.M.S. *Sanspareil*, at this dockyard. The inventor is Mr. Murdoch, her first-class chief engineer, who has been engaged in perfecting this peculiar motion, and its application to steam vessels, for the last three or four years, and who, so far from keeping it a secret, has, to my knowledge, shown it to all who feel an interest in the progress of marine machinery, especially as applicable to Her Majesty's service, for the last six or eight months, and would have given the world the benefit of his ingenuity in this case long ago, but for his desire to make it as perfect as possible, for which purpose he has constructed his machine upon the most scientific principles in conformity with practical experience. I feel assured that Mr. Murdoch would have great pleasure in answering any inquiries on the principle, theoretically or practically, and I believe would, in so doing, prove to the mechanical world himself to be the real inventor of the best and most simple form of engine for producing two revolutions of the crank-shaft for every stroke of the piston.

I am, Sir, yours, &c.,

John Anthony.

Devonport Iron-works, Devonport, May 8, 1852.

First Set of Rules and Regulations under the Act 15 & 16 Vic. c. 83, for the passing of Letters Patent for Inventions from and after the 1st day of October next.

By the Right Honourable Edward Burtenshaw Lord St. Leonard's Lord High Chancellor of Great Britain, the Right Honourable Sir John Romilly Master of the Rolls, Sir Frederick Thesiger, Her Majesty's Attorney General, and Sir Fitzroy Kelly, Her Majesty's Solicitor General, being four of the Commissioners of Patents for Inventions under the said Act.

WHEREAS a commodious office is forthwith intended to be provided by the Crown as the Great Seal Patent-office; and the Commissioners of Her Majesty's Treasury have, under the powers of the said Act, appointed such office as the office also for the purposes of the said Act.

All petitions for the grant of Letters Patent, and all declarations and provisional specifications, shall be left at the said Commissioners' office, and shall be respectively written upon sheets of paper of 12 inches in length by 8 inches and a half in breadth, leaving a margin of 1 inch and a half on each side of each page, in order that they may be bound in the books to be kept in the said office.

Every provisional protection of an invention allowed by the Law-officer shall be forthwith advertised in the *London Gazette*, and the advertisement shall set forth the name and address of the Petitioner, the title of his invention, and the date of the application.

Every invention protected by reason of the deposit of a complete specification shall be forthwith advertised in the *London Gazette*, and the advertisement shall set forth the name and address of the Petitioner, the title of the invention, and date of the application, and that a complete specification has been deposited.

Where a Petitioner applying for Letters Patent after provisional protection, or after deposit of a complete specification, shall give notice in writing at the office of the Commissioners of his intention to proceed with his application for Letters Patent, the same shall forthwith be advertised in the *London Gazette*, and the advertisement shall set forth the name and address of the Petitioner and the title of his invention; and that any persons having an interest in opposing such application are to be at liberty to leave particulars in writing of their objections to the said application at the office of the Commissioners within twenty-one days after the date of the Gazette in which such notice is issued.

The charge for office or other copies of documents in the office of the Commissioners shall be at the rate of twopence for every ninety words.

PATENT LAW AMENDMENT ACT, 1852,
15 & 16 VIC. c. 83.

By the Right Honourable Edward Burtenshaw Lord St. Leonard's, Lord High Chancellor of Great Britain, and the Right Honourable Sir John Romilly, Master of the Rolls.

ORDERED, That there shall be paid to the Law-officers and to their clerks the following fees:

By the Person opposing a Grant of Letters Patent.

	£	s.	d.
To the Law-officer............	2	12	6
To his clerk	0	12	6
To his clerk for summons......	0	5	0

By the Petitioner on the Hearing of the Case of Opposition.

	£	s.	d.
To the Law-officer............	2	12	6
To his clerk	0	12	6
To his clerk for summons......	0	5	0

By the Petitioner for the Hearing, previous to the Fiat of the Law-officer allowing a Disclaimer on Memorandum of Alteration in Letters Patent and Specification.

	£	s.	d.
To the Law-officer	2	12	6
To his clerk	0	12	6

By the Person opposing the Allowance of such Disclaimer or Memorandum of Alteration, on the Hearing of the Case of Opposition.

	£	s.	d.
To the Law-officer............	2	12	6
To his clerk	0	12	6

By the Petitioner for the Fiat of the Law-officer allowing a Disclaimer or Memorandum of Alteration in Letters Patent and Specification.

	£	s.	d.
To the Law-officer............	3	3	0
To his Clerk	0	12	6

PATENT LAW AMENDMENT ACT, 1852,
15 AND 16 VIC. C. 83.

ORDERED by the Right Honourable Edward Burtenshaw Lord St. Leonard's, Lord High Chancellor of Great Britain.

All specifications in pursuance of the

conditions of Letters Patent, and all complete specifications accompanying petitions and declarations before grant of Letters Patent, shall be filed in the Great Seal Patent-office.

All such specifications shall be respectively written upon both sides of a sheet or sheets of parchment, each page being of the size of eighteen inches in length by twelve inches in breadth, leaving a margin of one inch and a half on each side of each page, in order that they may be bound in the books to be kept in the said office; but the drawings accompanying such specifications, if any, may be made upon larger sheets of parchment than of the size of eighteen inches by twelve inches, leaving a margin of one and a half inches, as aforesaid.

The charge for office or other copies of documents in the Great Seal Patent-office shall be at the rate of twopence for every ninety words.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING SEPTEMBER 16, 1852.

GEORGE LEOPOLD LUDWIG KUFAHL, of Christopher-street, Finsbury, engineer. *For improvements in firearms.* Patent dated March 3, 1852.

The improvements claimed under this patent have reference to firearms of the needle class, and are described as applied to needle rifles and repeating pistols. They comprehend—

1. The application of a stud and disc, or their equivalents to the needle conductor.

2. A system or mode of engaging and disengaging the needle with the tumbler or lock apparatus.

3. The application and use of a piston or traversing filling-up piece for the prevention of gaseous escape into the lock.

4. The adaptation of the lock tumbler for the prevention of the withdrawal of the inner tube or chamber from its socket, except at a certain position of the tumbler.

JAMES PILBROW, of Tottenham, civil engineer. *For certain improvements in apparatus for supplying the inhabitants of towns and other places with water.* Patent dated March 3, 1852.

Mr. Pilbrow proposes to prevent waste of water from accident or carelessness by applying between the main and service pipe a tube or chamber of any required capacity, placed in an upward inclined position, and containing a hollow metal, or wooden ball, weighted so as to be of greater specific gravity than water, and of a diameter nearly equal to that of the tube or chamber. Under ordinary circumstances the ball would remain at the lower end of the tube, but when the service tap is turned, and water is to be drawn off, the pressure of the water from the main causes the ball to rise in the tube until it reaches the top, and closes the connection between the tube and service tap and stops the further flow. As soon as the service tap is closed, the specific gravity of the ball being greater than that of water, causes it to descend in the tube until it reaches the bottom, where it remains until the service tap is again opened.

GEORGE WILKINSON, of Streatham-terrace, Shadwell, engineer. *For improvements in ships' and other pumps.* Patent dated March 4, 1852.

The principal peculiarity of Mr. Wilkinson's pumps is, that the upper valve is made of larger diameter than the lower one, for the purpose of permitting access to the latter through the upper valve. The valve box and pump barrel are side by side, and formed in one casting. The suction-pipe, which carries the lower valve, rises into the valve-box, and has a cup formed around its upper edge, in order always to keep the lower valve covered with water, and there is always water under the plunger in the lower part of the barrel owing to the peculiar position of the suction-pipe. The plunger has two apertures formed in it and covered with leather flaps, in order to permit of the escape of air.

Claim.—The combination or arrangement of parts described.

ALFRED TRUEMAN, of Swansea, manager of copper smelting works, and JOHN CAMERON, of Loughor, chemist. *For improvements in copper from ores.* Patent dated March 4, 1852.

These improvements have reference principally to the treatment of sulphuret ores of copper in the state of regulus, when oxide ores are used, and they consist in so adapting the proportions of each to the other as to cause, not only combination of the sulphur and oxygen in the ores, but also the abstraction of any iron present by its affinity for silica, of which substance, when the ores do not contain sufficient, a small proportion must be added. This process of adjustment enables the use of carbonaceous matters to be dispensed with. When any quantity of antimony or arsenic is present in the regulus operated on, it may be abstracted by boiling in an alkaline solution; and this boiling operation will be found useful, even if other modes of treatment than those of the patentee's are adopted.

Claims.—1. The boiling of a regulus of copper in an alkaline solution (for the purpose of separating antimony, arsenic, &c.

2. The mode of obtaining copper from copper ores, whereby not only are the oxygen and sulphur in the mixture adjusted to each other, but the iron and silica are also adjusted to each other.

ALEXANDER PARKES, of Birmingham. *For improvements in separating silver from other metals.* Patent dated March 8, 1852.

In consequence of this patent extending to the Colonies only, the specification is a verbatim copy of the English one enrolled previously, see vol. lvi., p. 18.

CHARLES AUGUSTUS PRELLER, of Abchurch-lane, merchant. *For improvements in the preparation and preservation of skins, and animal and vegetable substances.* (A communication.) Patent dated March 8, 1852.

This invention consists in impregnating skins with a composition or compound, of certain animal, vegetable and saline substances by mechanical agitation, with or without the aid of heat or warmth.

In forming his preserving composition, the patentee uses such vegetable substances as consist largely of starch, and contain little gluten, such as barley flour, rice flour, or starch itself. The animal materials which he employs are ox brains, butter, milk, animal oil and grease; and the saline substances, are salt or saltpetre. The following proportions form a composition which answers well, but they are capable of considerable variation. Barley flour, 26 lbs.; ox brains, 23 lbs.; salt or saltpetre, 4 lbs. Unsalted butter, 6½ lbs.; milk, 12½ lbs.; animal oil, such as neatsfoot oil, or horse grease, 28 lbs. The butter and brains are first mixed together, then the flour is added by degrees, then the oil, and finally the milk. The salt being intended to preserve the butter and brains may be added to either of them before being mixed.

The skins to be treated having been unhaired, steeped, and partially dried, are placed in a revolving cylinder, where they are agitated until the moisture which they still retain is equally diffused. They are then smeared on the flesh side with the composition above mentioned, and again agitated, and this smearing and agitating is repeated until the desired effect is produced, the thicker kinds of skins requiring the most lengthened treatment. The subsequent operations are the same as those usually followed by curriers to prepare the skins for manufacturing uses, but the currying will be found to have much facilitated by the patentee's treatment.

When heat is to be applied during this treatment, hot air is admitted to the interior of the revolving cylinder. Other mechanical means of agitation than a revolving cylinder may also be employed. The patentee also treats animal and vegetable substances, especially such as are of a fibrous character, by the above process, or by impregnating them with a composition formed by soaking chips of skins in water.

FREDERICK GEORGE UNDERHAY, of Well's-street, Gray's Inn-road, engineer. *For improvements in apparatus for regulating the supply of water to water-closets and other vessels, and in taps or cocks for drawing off liquids.* Patent dated March 8, 1852.

Claims.—1. A mode of regulating the supply of water to water-closets and wash-hand basins. (Connected with the water-closets and wash-hand basins is a cylinder containing water, and having a piston fitting loosely in it, so as to allow the water to pass slowly between the piston and the sides of the cylinder. The piston-rod is connected with the handle of the water-supply cistern in such a manner, that when the water is let on, by raising or otherwise moving the handle, the piston is raised in the cylinder, and by its fall, which will be more or less rapid according to the size of the piston, the supply of water will be regulated. An elastic bag containing air may also be used for the same purpose.)

2. A mode of combining the parts of cocks or taps. (The peculiarity of these taps consists in the valves being combined with a cylinder, which moves in the barrel, and by raising which the valves are simultaneously lifted from their seats, and a passage for the liquid opened through and around the cylinder. The same arrangement may be also applied to ball or float cocks.)

3. A mode of combining the parts of ball or float cocks or valves. (In these cocks there is only a single valve employed, which is opened by the action of the float either with or against the flow. The valve is prevented from being carried too far off its seat by the application of a piece of vulcanised India rubber.)

GEORGE WRIGHT, of Sheffield, and also of Rotherham, artist. *For improvements in stoves, grates, or fireplaces.* Patent dated March 8, 1852.

Mr. Wright's improvements in grates and fireplaces consist in forming the front bars in one casting with a plate or surface which projects into the room and diffuses the heat by radiation. The grate-bars are made to incline backwards over the fire so as to absorb more heat. The dust and ashes fall on the projecting plate, and through an aperture in it to the ashpan, which is placed beneath the plate. When the ashpan is required to be emptied, it is removed through an opening cut in the front plate, which open-

ing is covered with a light ornamental casting, or the whole of the front plate might be made to turn on pivots or hinges, so as to admit of its being raised for the same purpose. The ends of the plate are fitted with sliding ornaments, by shifting which the plate may be adjusted to suit mantelpieces or fireplaces of different styles and sizes.

This improvement is also applied to stoves in combination with a hood or muffle over the fire, by which the escape of gases in an unconsumed state is prevented.

Claims.—1. The arrangement or construction of stove-grates, stoves, or fireplaces, in which the front bars and a projecting metallic plate or plates or surfaces are cast together, so that the front bars—being in contact with the ignited fuel—may receive heat therefrom, and conduct it down the metallic plate or plates or surfaces, which extend or project into the room, in which it is given off from the metallic plates or surfaces by radiation, and becomes diffused in the room.

2. The employment of the moveable end ornaments, and their adaptation to the ends of the metallic plates, so as to cause the same to fit mantelpieces or fireplaces of different sizes and styles.

3. The means whereby the ashpan may be removed when required, without the necessity of bodily removing the whole of the projecting metallic plate or plates or surfaces.

JAMES GRAHAM, of Camden-grove, Peckham. *For improvements in treating ores containing zinc, and the products obtained therefrom.* Patent dated March 8, 1852.

Mr. Graham's *first* improvements have relation to the treatment of the zinc ores known as blende and calamine, from the first of which he proposes to obtain sulphurous acid gas; and from the second, carbonic acid gas, by roasting them in close vessels or furnaces. The sulphurous acid may be converted to sulphuric acid by any known process, and the carbonic acid applied to any of the purposes for which it is calculated.

The *second* part of the invention consists in manufacturing oxide of zinc from blende and calamine, treated as above described. This process is conducted in a peculiar arrangement of furnace which the patentee describes, the ores having first added to them a certain quantity of anthracite, coal, charcoal, or other carbonaceous matter.

Claims.—1. The roasting or calcining that zinc ore which is called blende, in close vessels or furnaces, so as to obtain sulphuric acid during the process of such treatment in the manufacture of oxide of zinc.

2. The roasting or calcining the zinc ore known as calamine, in close vessels or furnaces, so as to obtain carbonic acid during the process of such treatment in the manufacture of oxide of zinc.

3. A peculiar mode of arranging the pots or retorts, the oxidizing chamber and the holes for keeping the pipes clear; also, of preventing explosion of the gases in the manufacture of oxide of zinc from blende and calamine.

EDWARD MOSELEY PERKINS, of Mark-lane. *For improvements in the manufacture of cast-metal pipes, retorts, or other hollow castings.* Patent dated March 8, 1852.

Mr. Perkins's improvements consist of a mode of constructing hollow core barrels, to be used in the manufacture of cast-metal pipes, retorts, &c., so as to admit of their being contracted or expanded at pleasure, whereby their withdrawal from the mould is much facilitated.

Claim.—The mode described of making core-barrels used in the manufacture of cast-metal pipes, retorts, or other hollow castings.

WILLIAM SMITH, of Park-street, Grosvenor-square, civil engineer, and ARCHIBALD SMITH, of Princes-street, Leicester-square. *For certain improvements in electric and electro-magnetic telegraph apparatus, and in the machinery for and method of making and laying down submarine, submerged, and other such lines.* Patent dated March 8, 1852.

Claims.—1. A mode of insulating suspended wires at their points of support.

2. Certain arrangements of machinery for making telegraphic cables.

3. The setting up of such or analogous machinery on board steam or other vessels, whereby telegraphic cables may be manufactured and submerged simultaneously.

4. A mode of testing the conducting power of telegraphic wires as they are being made into cables.

JOSHUA CROCKFORD, of Southampton-place, Middlesex, gentleman. *For improvements in brewing and in brewing-apparatus.* Patent dated March 8, 1852.

Claims.—1. The causing, in the process of mashing, the fresh accessions of heat to the liquor to be successively and equally circulated or diffused throughout the entire mass, by the continuous application of mechanical force.

2. An improved mash-tun described, in so far as respects the employment therein for the purpose of the invention of a screw (or other equivalent substitute), an outer casing, and a channelled and perforated diaphragm.

3. The improvement of Field's alcohol

meter, by the addition thereto of a condenser.

Alexander Cuninghame, of Glasgow, iron-master. *For improvements in the treatment and application of slag, or the refuse matter of blast-furnaces.* Patent dated March 8, 1852.

1. Mr. Cuninghame proposes to run the slag direct from the blast-furnace into water, to facilitate the subsequent operation of grinding or pounding to which it has to be submitted. It is then treated with sulphuric acid to act on the lime, silica, and magnesia present, and to convert the alumina contained in it to sulphate of alumina, which may be used to manufacture alum. The residue, when the sulphate solution is thus employed, consists of hydrate of silica and gypsum, which may be usefully applied as manure.

2. It is proposed to obtain silica, alumina, and chloride of calcium from slag, by treating it with muriatic acid instead of sulphuric, as before described.

3. The slag may be used in the purification of pyroligneous acid, instead of the lime ordinarily employed.

4. It may be applied in the decomposition of salts of soda and potash.

Claim.—The treatment and application of slag, or the refuse matter of blast-furnaces, for the purposes described.

Thomas Ellison, of Queen's-road, Pentonville, painter, plumber, and glazier. *For certain improvements in the manufacture of imitation marbles, granites, and all sorts of stones.* Patent dated March 8, 1852.

Mr. Ellison's improvements consist in the use of moulds or forms of glass, upon which the marbles or imitation stones are manufactured; the object being to enable the operator, during the progress of his work, to ascertain the effect produced, and to remedy defects when such exist. The process of manufacturing forms no part of the invention, and is conducted much in the same way as usual, the face of the artificial stone being made of fine cement (by preference Keene's), coloured according to the kind of stone to be imitated, and the body of cement or mortar of a common description. Pieces of slate are laid on the finer material before applying the body cement; and the face of the finished stone is coated with linseed or other oil, in order to preserve the colours and render the article impervious to wet.

Claim.—The making of imitation marbles, granites, and other kinds of stones upon glass, in the manner described.

William Pidding, of the Strand, gentleman. *For improvements in mining operations, and in the machinery or apparatus connected therewith.* Patent dated March 8, 1852.

Mr. Pidding proposes to substitute steam or other power for manual labour in drilling holes in rocks preparatory to blasting operations. For this purpose, he describes a peculiar construction of drill, which acts to enlarge and deepen a hole at the same time. He also proposes to facilitate the operation of drilling by applying heat and cold alternately to the rock to be bored. The tools used may be heated for this purpose, or heat may be applied directly, and the rock melted in certain parts by the addition of suitable fluxes; or a current of electricity may be employed as the heating means. The operation of blasting may be performed by filling a hole drilled in rock with water, then applying the galvanic current to disengage the gases of which the water is composed, and igniting the disengaged gases (when their expansive power alone is not sufficient to effect the disruption of the rock) by the same means. The blasting may be also effected or facilitated by igniting a charge of some explosive compound by a galvanic battery.

Mr. Pidding describes also a method of separating gold from quartz or other rocky matrix, by fusing the same by the aid of fluxes, such as soda, lime, fluor-spar, &c., the gold being deposited by its density in the melting vessel; or the gold quartz may be treated with nitro-muriatic acid, or a mixture of chromic and other acids and salts, and the gold precipitated from its solution by the aid of metallic iron, copper, or other metal.

Peter Van Kempen, of West Ham, Essex, accountant. *For an improved refrigerator to be used in brewing, distilling, and other similar useful purposes.* (A communication from Mr. A. G. Cramer, of Amsterdam.) Patent dated March 8, 1852.

This improved refrigerator consists of a long trough (say 280 feet long by 4 feet wide), of a serpentine form, and with a gradual incline, along which the wort or other liquors to be cooled are caused to flow. The bottom of the trough is made hollow, and a stream of water is forced through the hollow space in a contrary direction to that in which the liquid to be cooled is flowing; and, in order that the greatest possible frigorific effect may be transmitted to the liquid, the surface of the refrigerator is composed of copper, and it is made perfectly smooth, in order that the liquid may be distributed over it in a film of equal thickness throughout. In order to prevent the wort being soured by atmospheric electricity, a permanent conductor, composed of a strip of zinc in connection with the earth, is attached to the surface of the refrigerator in such a position as to be partially immersed by the liquid flowing over the apparatus.

Claim.—An improved refrigerator constructed as described, and of the peculiar form represented, in which worts or other liquids flow down an inclined channel, underneath which cold water or liquid is forced in an opposite direction; and the employment of a galvanic circuit in the said refrigerator, for the purpose of carrying off electricity from the worts.

Specifications Due, but not Enrolled.

JAMES WANBROUGH, of Albert-road, Mile-end, manufacturer, and WILLIAM ALLEN, TURNER, of Fish-street Hill, merchant. *For improvements in the manufacture of flocked fabrics.* Patent dated March 8, 1852.

WILLIAM WILLCOCKS SLEIGH, physician and surgeon, of London. *For a counteracting reaction motive power engine.* Patent dated March 8, 1852.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in propelling vessels.* (Being a communication). Patent dated March 8, 1852.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Henri Francois Toussaint, of Paris, gentleman, for improvements in obtaining a product from the wood of the cactus. September 10; six months.

Julian Bernard, of Guildford-street, Russell-square, Middlesex, gentleman, for improvements in the manufacture or production of boots and shoes, and in materials, machinery, and apparatus connected therewith. September 10; six months.

John Wright Treeby, of Elizabethan Villa, St. John's Wood, Middlesex, gentleman, for improvements in regulating the flow of liquids. September 10; six months.

Stephen Taylor, of New York, gentleman, for certain improvements in the construction of fire-arms, and in cartridges for charging the same. September 10; six months.

Alexander Stewart, of Glasgow, North Britain, manufacturer, for improvements in the manufacture or production of ornamental fabrics. September 10; six months.

Frederick Sang, of 58, Pall-mall, Middlesex, artist in fresco, for certain improvements in floating and moving vessels, vehicles, and other bodies on and over water. September 16; six months.

Charles Augustus Peller, of Abchurch lane, London, merchant; John Eastwood, of Bradford, York, woolcomber; and Samuel Gamble, of Bradford aforesaid, machine-maker, for improvements in machinery for combing, drawing, or preparing wool, cotton, silk, hair, and other fibrous materials. September 16; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Sept. 11	3369	A. Aubert	Nantes, France	Oyster opener.
15	3370	S. and M. Meyer	Bow-lane, Cheapside	Joint for parasols, umbrellas, fishing-rods, &c.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Sept. 13	465	J. Magness	Upper Southwick-street	Oval chimney valve.
14	466	J. Brown	Upper Norton-street	Combined cigar-holder and piercer.

Notice to Correspondent.

I. B. (Langton, Staffordshire.)—A reply to your questions will be forwarded to you by post, on your favouring us with your private address.

CONTENTS OF THIS NUMBER.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1520.] SATURDAY, SEPTEMBER 25, 1852. [Price 3*d*., Stamped 4*d*.

Edited by J. C. Robertson, 166, Fleet-street.

SIR GEORGE CAYLEY'S GOVERNABLE PARACHUTES.

Fig. 2.

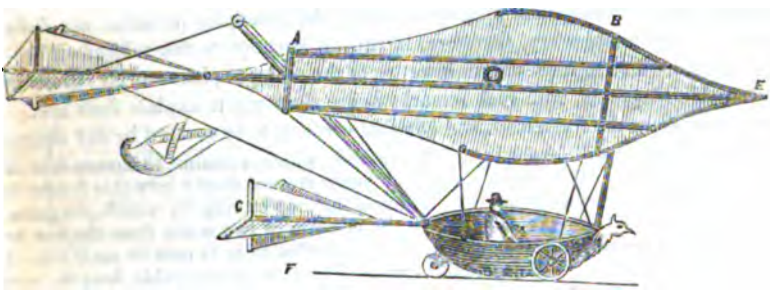
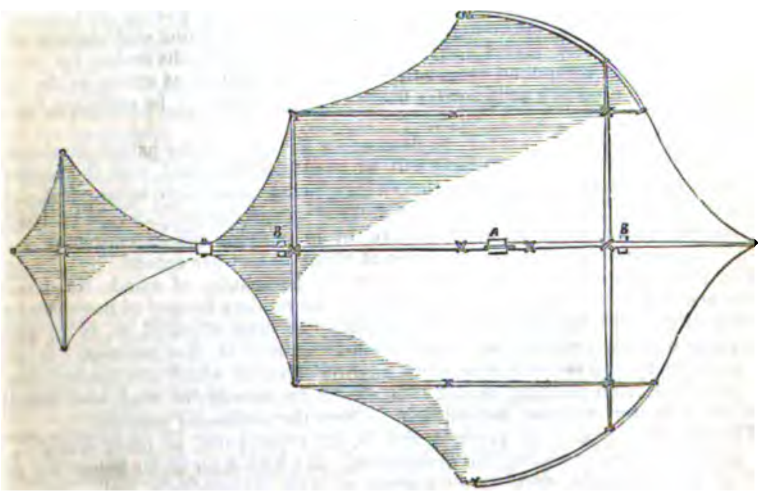


Fig. 1.



SIR GEORGE CAYLEY'S GOVERNABLE PARACHUTES.

SIR,—As the subject of parachutes again attracts public attention, permit me to suggest what would be an interesting addition to the mere hackneyed fact of their descent—their steerage from the moment they are liberated from the balloon to any desired landing-place, within about five to six times the distance horizontally that the balloon is then above the earth. Thus, were the balloon a mile from the earth, the aëronaut would have the command of a descent anywhere within a circle of ten or twelve miles in diameter, having the point immediately under the balloon for its centre. Many years ago, the safe descent and perfect steerage of such parachutes were ascertained on a scale of four hundred feet of surface, and notices of these experiments were published in "Nicholson's Chemical Journal," and the early Numbers of the *Philosophical Magazine*, where the principles in action are fully illustrated. It is unnecessary, therefore, in calling attention to this subject, at present, to do more than to request your insertion of the enclosed plans and elevations in your valuable Magazine, with such remarks as are necessary to explain their use.

Fig. 1 represents the framework and external cordage, to be covered by 467 square feet of light cloth or silk, exclusive of the rudder, which contains 48 square feet in its horizontal extent. The places marked by small crosses show where this frame is attached to the car by ropes or wires. A shows the loop or ring by which the parachute is suspended from the balloon; B the position of two masts from the car to this framework, the upper portions of which are divided so as to pass on each side of the long central beam. This central beam, being of considerable length, and although braced so as not to permit any extensive length of leverage to affect it, will require, as the main basis of the structure, to be firm and strong; and as lightness of construction is required as well as strength, a taper tubular beam would be desirable; but these are difficult to make, and very nearly the same result as to strength combined with lightness of structure is obtained by nailing and glueing together four flat pieces of timber into a hollow square, and making these taper both in width and thickness from the centre towards each end—a beam of fir, having four inches for the side of its square in the centre of its length, each piece being eight-tenths of an inch thick at that place, leaves a square space of two four-tenths inches for its side measure; and this compound beam will be very nearly double as strong as the same weight of wood used as a solid square beam: such a beam will be sufficient for this parachute.

F is a horizontal line, to mark the descending obliquity of the parachute above it. The whole weight of this parachute will be about 150 lbs., and, with the aëronaut, say 300 lbs; the surface, including the rudder, being about 500 square feet. The greatest velocity it can attain, were it to descend perpendicularly, would be 16¼ feet per second, which would be about equivalent to jumping off an eminence 4 feet high. Its angular velocity may be taken at about 30 feet per second.

Fig. 2 is a perspective elevation of the whole parachute, of which No. 1 is the frame and sail. It is here seen that there are two rudders formed of horizontal and vertical sails. The larger one is, when it has once been adjusted so as to give a straight and steady steerage, to be permanently secured in that position. It gives the most steady and secure course when slightly elevated, which also tends to secure the parachute from pitching, should it be exposed to an eddy of wind, and, together with the weight of the car, immediately restores the horizontal position.

The two cross-beams, or yards, A and B, are represented as being straight, for the purpose of not confusing the perspective; and with a car so far below the main sail of the parachute, they would answer in calm air perfectly well; but every caution should be taken in trusting human life to so capricious an element, and therefore these yards should form an angle of 160° at their centre, or, what amounts to the same thing, rise in an angle of 8° above their present horizontal line on each side. This form, like the elevation of the rudder, tends powerfully to right the

parachute in all cases of accidental disturbance. The smaller moveable rudder C, is sufficient to effect at will the steerage of the parachute, and to elevate or depress its course when occasion requires, or preparatory to alighting on the ground. The main rudder, by means of strong ropes, one of which passes through an eye on the top of the mast at D, can be firmly braced to its best adjustment from the car. Another use may be made of this parachute by making it steer the balloon considerably when ascending with velocity. Let a small rope from the car of the balloon be

Fig. 3.

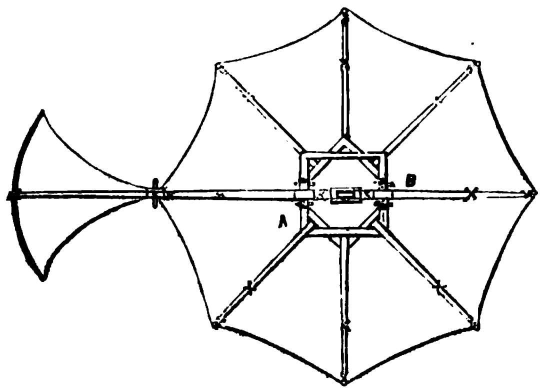
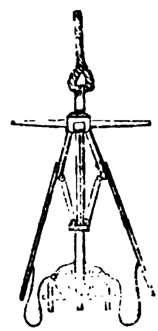


Fig. 4.



fastened to the end of the main beam at E, by which the parachute can be elevated in front to any required angle, when the resistance of the air, acting obliquely upon it, would give the whole combined fabric the power of steerage, by a large vertical rudder in the car of the baloon. The danger of using this mode of action would be from the neglect of liberating this rope, previous to the parachute being freed for its descent.

Fig. 3 represents a guidable parachute, formed on the umbrella plane, so that it can fold down in two halves on hinges at A and B, like the leaves of a table, and thus not obstruct the velocity of the balloon in ascending. Its construction is so readily understood as to require no further explanation. Fig. 4 shows this parachute when not expanded for use. It must have the moveable rudder, as before named, in the car.

Although the safe descent and steerage of such aërial vehicles has been abundantly proved, when properly adjusted, by their being launched from hill-tops into the valleys below, loaded up to a pound weight to the square foot of surface; yet no human lives should be put to hazard in these parachutes, until a considerable series of descents have been made safely with dead weights, exceeding that of the person wishing to try the experiment. The centre of gravity of the car and its load must be so much in advance of the centre of resistance of the main-sail as will incline it downward in front in an angle of 5° or 6° with the horizon. A few trials as to the required position of the permanent rudder, so as to adjust the angle of the descent to be steady, and not subject to alternate rises and falls, will soon enable more extensive ranges to be made. The small irregularity of resistance made by one side of the parachute over the other, which it is impracticable to avoid, has then

to be corrected by a slight side movement of the rudder, bringing its vertical surface to act in the contrary direction, and thus to bring the steerage into a straight course.

It need scarcely be further remarked, that were we in possession of a sufficiently light first mover to propel such vehicles by waftage, either on the screw principle or otherwise, with such power as to supply that force horizontally, which gravitation here supplies in the descent, mechanical aërial navigation would be at our command without further delay.

Those who may wish to go more minutely into this subject will find it investigated in the twenty-fifth volume of "Nicholson's Journal of Natural Philosophy," &c., for the year 1810, pp. 83 and 161.

I am, Sir, your obliged and obedient Servant,

GEORGE CAYLEY.

Brompton, September 15, 1852.

ON THE SUBSTITUTION OF BORAX FOR SOAP IN THE SCOURING OF SILK.
BY PROFESSOR BOLLEY.

(Translated for the "Mechanics' Magazine" from the "Swiss Journal of Industry.")

Repeated experiments, though only made on a small scale, having proved that borax may be used for the purpose of freeing silk from its glutinous coating, I was induced to make these experiments by the idea that borax, in case it should serve for this purpose, it would not, as is the case with soap, be entirely lost, but might always be recovered from the solutions. My experiments have proved fully that borax in solution in water, when boiling from 1 to 1½ hour with a quantity of silk double its weight, is capable of scouring this latter sufficiently, and that, in order to render the process more complete, the silk need only be boiled a second time with a solution of the same strength; but for practical purposes, I think it would be advisable to accomplish the first part of the scouring (which the dyers call the "degommage") by employing the borax solution, and to complete the process, or what is called by them the "boiling," by means of soap. In order to recover the borax after it has been used, soda should be added to the solution, and the whole submitted to evaporation, which may be done in summer by exposing the solution in the open air in shallow evaporating vats, when the borax will be obtained in the form of crystals. The mother water, which contains albuminous and gelatinous substances, may also be evaporated, and after calcining the residuum and dissolving the same in water, and crystallising, the whole of the borax employed will be recovered.

Silk submitted to this process will be found to be very soft, the yellow sorts will become nearly white, and, on examining the fibres of silk with a microscope, it will be found that they have sustained no injury, and have retained their original strength just as if they had been treated according to the ordinary method. In fact, no danger whatever arises from this process in the quality of the produce. According to the opinion of some of the most eminent Swiss manufacturers, to whom Professor Bolley submitted the samples of silk prepared in this manner, and who were not able to discover the least difference in quality between his specimens and silk treated in the ordinary manner.

As regards cost of the process, this depends entirely on the price of borax, and on the cost of fuel, and of time in the evaporating process, and on other local circumstances, and from the price of soap. Professor Bolley thinks 30 lbs. of soap may be saved on every cwt.

MATHEMATICAL PERIODICALS.

(Continued from page 66.)

XXVII.—*The Mathematical Repository.*—(*Original Papers Continued.*)

Art. I. Part. II., Vol. VI. Two Indeterminate Problems. By Mr. James Cunliffe.

Art. II. A complete solution of Problem IX., *Gentleman's Diary*, 1829. By C. F. Barnwell, Esq., of the British Museum; communicated by Mr. T. S. Davies.

Problem. Given the vertical angle, and the difference between the base and each of the sides, to construct the plane triangle.

Art. III. On Rule Surfaces. By Mr T. S. Davies. Bath.

[Mr. Davies in this paper gives some "notes towards a history of the investigations of the properties of surfaces traced by the motion of a straight line," which were intended to be comprised in three sections. The first, or "Preliminary," section comprises the labors of Dr. Wallis, Sir Christopher Wren, M. Parent, Sir Isaac Newton, Dr. Brakenridge, M. Mauduit, M. Tinseau, interspersed with copious notes and critical observations; the second section was designed to "Embrace the labors of Euler, Monge, and Meusnier, and the third, those of Hatchette and the *Eleves de l'Ecole Polytehnique*," but owing to the discontinuance of the *Repository*, and the insertion of more generally important matter, only the first section was printed; which, however, comprises nearly the whole of this subject that "has escaped the notice of the modern French Mathematicians, as they consider the investigation to have been altogether effected in the Polytechnic School." In a note, on pages 19, 20, he dispels the notion that Maclaurin was "the author of the present system of Analytical Geometry of Three Dimensions," and proves that the "contrivance .... *is due solely to Clariault*," since it was "made known by him to the *Académie* in 1728."]

Art. III. (*bis.*) On the Stereographic Projection of the Sphere. By Mr. T. S. Davies, Bath.

[This paper is an addition to Art. VI., Vol. V., and contains a series of arguments tending to prove that "*this beautiful property* (3) .... *belongs incontestably to Dr. Hooke.*"]

Art. V. Horæ Arithmeticæ. No. VIII. *Memoranda.* By W. G. Horner, of Bath.

[In this article Mr. Horner alludes to the failure of his Essay on Algebraical Transformation to obtain a place in the *Philosophical Transactions*, which he observes "has lain upwards of seven years in the silence of the archives." Since that time, however, an improved transcript has been printed by Professor Davies, in the *Mathematician;* which possesses sufficient interest, even now, to prove that the Transactions of the Royal Society would not have been degraded by its admission. After a few preliminary remarks, Mr. Horner proceeds to examine Mr. Charles Bonnycastle's "Method of Approximation to the roots of Equations," inserted in the Appendix to "Bonnycastle's Instruction to Algebra," in the course of which he shows, "that in pursuing the same track which he had entered, *the next step of abbreviation* would have brought him to my (Horner's) cubic formula, and so on, until the whole of my process was developed." The concluding portion of the paper is occupied with the statement "of a new method of approximating to odd roots of numbers," but he offers "it as a matter of *curiosity only*."]

Art. VI. Analytical solution of the Prize Question (510), in the *Repository*, for the case of the Triangle. By T. S. Davies.

[It is remarked in the introductory observations, that the "chief purpose" of this solution "is for comparison with the two solutions of that case given in the *Gentleman's Mathematical Companion* for 1813."]

Art. VII. Researches in the Geometry of Three Dimensions. By Mr. T. S. Davies, Bath.

On the Conoids, or surfaces of Revolution of the Second order.

[Of these researches only the introductory portion was printed, but in place of what ought to have followed reference may be made to the article "Conoids of Revolution," in the second volume of the 12th edition of Hutton's Course. In the course of his observations, Mr. Davies institutes a comparison between the writings of the An-

cients and the Moderns as regards *geometrical* investigations, and gives several cogent reasons why in recent times the Conoids had been comparatively neglected. The Wallisian notion "*that* $\sqrt{-1}$ *signifies an angle*," is discussed in a long note on pp. 62, 3, in reference to the opinions of Warren, Mourey, Peacock, Wallis, Carnot, Foucenex, Buée, Argand, Francais, Gergonne, Servois, and Gompertz, where he announces his intention to publish an essay on the subject "in which the whole system of inquiry will be discussed." This dissertation, however, was never published; but his opinion, that "*the symbol* $\sqrt{-1}$ *does not express perpendicularity, but only incongruity amongst the geometrical conditions from which the expression was derived*," was afterwards enforced in a paper printed in the *Philosophical Magazine* for September, 1846, under the signature "Shadow," and has more recently been *re-asserted* in a note to one of Mr. Cockle's papers in the 34th volume of the same Journal; where the latter gentleman has maintained the opposite or *analytical* view with his usual clearness and originality. M. Carnot's objections to the use of the signs + and − in geometry have also been ably disposed of by Professor Young, in his *Mathematical Dissertations*.]

Art. VIII. (*bis*.), and XV. On Spherical Geometry. By Mr. T. Davies, of Bath.

[These papers contain some of the most interesting and important investigations which ever engaged the attention of Mr. Davies. In "Section First" he developes the properties of "Great Circle Transversal," with a view "to show the analogy that subsists between the *plane and spherical harmonicals*." Taking the properties developed by Carnot as his basis, he deduces a series of Spherical properties as elegant as they are extensive, including not only analogues to the divisions of a line in Euclid ii., but also to the various properties of the perpendiculars, the bisectors of the sides and angles, of triangles, together with the now well-known relations amongst the segments of the sides when cut by any transversal. In "Section the Second," he treats on "Less-Circles of the Sphere in connection with Great-Circles Transversals," and by a series of elegant processes he deduces the Spherical analogues to the properties of the *Radical Axes* and *Polis of Similitude*, amongst which is that to "Monge's beautiful Theorem concerning the mutual tangents of three circles."

A selection from these researches was subsequently appended as a "Supplement" to the first edition of Professor Young's *Elements of Plane and Spherical Trigonometry*, and one more copious still, in the 12th Edition of "Hutton's Course." The methods of investigation, however, are not always identical in the works referred to, and hence the student will do well to consult the *original* investigations in the *Repository*, as well as those connected with them in the *Diaries* and the *Mathematician*, by Dr. Rutherford and Messrs. Fenwick, Beecroft and Weddle.]

Art. VIII. and XVIII. Propositions in the Lunar Theory. By the Rev. Brice Bronwin.

Prop. I. To find the disturbing forces of the Sun on the Moon.

Prop. II. To find the progression of the Lunar Apogee.

Prop. III. To find the eccentricity of the Moon's Orbit.

Prop. IV. To find the mean distance and mean motion.

Prop. V. To find the equations of the centre.

Prop. VI. To find the variation, or deviation from an elliptic movement.

Prop. VII. To find the equations depend on the angle ω.

Prop. VIII. To find the reduction to the ecliptic.

Prop. IX. To find the Moon's Latitude.

Prop. X. To find the Equatorial horizontal Parallax.

Prop. I. *Supplement*. To find the mean distance, eccentricity, and progression of the Apogee from the differential equations of the Moon's motion.

Prop. II. and III. The same, by other methods.

Prop. IV. To find the regression of the Nodes and variation of the inclination.

[Mr. Bronwin was induced to lay these methods before the public, in consequence of the erroneous nature of the methods hitherto given for the same objects; those of Vince, for instance, being "almost from beginning to end .... confused and

erroneous." "Very accurate results" are not his object, but it "is intended to establish a Theory of the Moon upon indirect principles something like correct."

Art. IX. To find the attraction of an oblate spheroid of small ellipticity on a point without it. By the Rev. Brice Bronwin.

Art. X. On the Expansion of Functions. By the Rev. Brice Bronwin.

Art. XI. Four Indeterminate Problems. By Mr. John Davey, of St. Just, in Penrith, Cornwall.

Art. XII. Solution to a Physical Question. By Mr. W. S. B. Woolhouse.

[This question was proposed by Mr. Woolhouse as No. 1,280, in the *Gentleman's Diary* for 1831, and was solved on erroneous principles by Mr. Taylor in the following Diary. A solution is here given in accordance with the proposer's views.]

Art. XIII. To prove that the Area of a Cycloid is three times the Area of its generating circle. By Lieutenant Colonel Glover.

Art. XIV. Certain properties of a plane triangle briefly demonstrated. By Mr. James Cunliffe, London.

[The *first* of these properties is, that the perpendiculars upon the sides from the angles meet in a point, and the *second* determines the point of their intersection, independently of drawing the perpendiculars themselves. Various collateral properties are deduced from the requisite diagrams, which are next applied to the geometrical construction of eight accompanying problems.]

Art. XVI. Two indeterminate Problems. By Mr. James Cunliffe, London.

T. T. W.

(*To be continued.*)

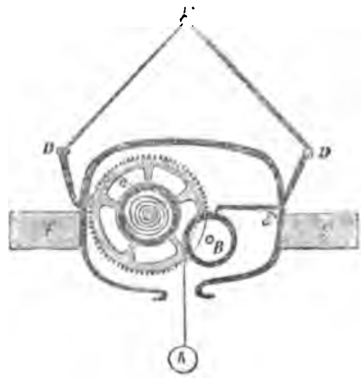
Burnley, Lancashire, September 15, 1852.

IMPROVED SOUNDING LEAD.

Sir,—I beg to submit to you a plan for obviating the inaccuracy prevalent in the present system of ascertaining soundings by means of the ordinary hand lead.

The principle is that of a machine so constructed, as on being let go from a vessel with a slack rope, to take the soundings *automatically*, recording the perpendicular depth of water upon a dial-plate. This suggested itself some time since, when my brother and myself devoted much time to various inventions and improvements.

The manner in which it may be carried out is best shown by the following sketch and description:



A, the weight for taking the soundings; B, the barrel on which the sounding is wound, with a pinion-wheel on the axle; C, a cog-wheel, with either a weak spring, or a ratchet escapement attached. This wheel turns the indicating hand upon the dial-plate outside. On the weight descending, this cog-wheel is slowly turned round by pinion of B. D D, are two detents, which on hauling in by the rope E, check the revolutions of B and C, and thus fix the result. F is a belt, say of cord, fixed to the apparatus to float it.

The machine is thrown into the water with the rope E, slack. The weight A, instantly descends. On reaching the bottom, the spring, or ratchet of C, prevents any further unwinding of the sounding rope from the barrel.

The slack of E is then gathered up, and the apparatus hauled in. This places the two detents, D D, upon C and B, and fixes the result as shown by the index hand.

I am, Sir, your obedient Servant,

Edward B. Bright.

6, North John-street, Liverpool,
August 30, 1852.

EFFECT OF ROTATION ON FLOATING BODIES.

Sir,—The solution offered by Mr. Tebay of the Exciseman's Staff Question, though not so simple as that in which

the pressure of the fluid on the immersed portion of the staff is taken equal to the weight of the displaced fluid, as given by "Indagator," in No. 1517 of your interesting Magazine is, I think, deserving of especial notice, because the method he employs is general, and applicable to the case of fluids, when other forces, besides that of gravity, are in operation. To illustrate this, I propose to solve the following problem, which may possess some interest for several of your readers. A solid cylinder floats in a cylindrical bucket, partly filled with an incompressible fluid (water for instance), with its axis coincident with that of the bucket; a velocity of rotation ω is communicated to the whole about the common axis (which is vertical), to show that in consequence of the rotation the interior cylinder sinks through a space $= \frac{\omega^2}{49}(b^2 - a^2)$ where b is the radius of the bucket, and a that of the solid cylinder, g being the accelerating force of gravity.

Let l be the height of the fluid in the bucket before rotation; k the height of the bottom of the solid cylinder above the bottom of the vessel before, and k' after rotation. Let also ρ be the density of fluid. Take the plane of the base of the cylinder for the plane of $x\,y$, the axis of the cylinder being axis of z; and let p be the pressure at any point (x, y, z,) in the interior of the fluid after the rotary motion has been communicated; and let r be the distance of this point from the axis.

Then when the motion has become uniform, each particle of the fluid describes a circle in a horizontal plane round the axis of the cylinder; and therefore the effective accelerating force on it $= \omega^2 r$ directed towards the axis. Hence a force equal and opposite to this applied to each particle will, by D'Alembert's principle, together with the impressed force (gravity) satisfy the equation of fluid equilibrium. Now $\omega^2 r$ is equivalent to two $\omega^2 x$, parallel to the axis of x and $\omega^2 y$ parallel to that of y.

Hence the equation of fluid equilibrium becomes

$$\frac{dp}{\rho} = \omega^2 x dx + \omega^2 y dy - g dz,$$

or integrating

$$\frac{p}{\rho} = \tfrac{1}{2}\omega^2(x^2 + y^2) - g(z - c),$$

$$= \frac{\omega^2 r^2}{2} - g(z - c) \ldots\ldots (1);$$

$$\because\ x^2 + y^2 = r^2$$

In this equation it is necessary to determine c. Put $p = 0$, and the equation to the free surface of the fluid, for every point of which $p = 0$ is

$$z - c = \frac{\omega^2 r^2}{2g} \ldots\ldots\ldots\ldots\ldots\ldots (2),$$

a paraboloid of revolution.

Now evidently supposing none of the fluid to escape, since it is incompressible, the volume of the fluid before and after rotation must be the same. But before rotation, this volume

$$= \pi b^2 l - \pi a^2 (l - k),$$

and after rotation, the volume between the bottoms of the cylinders $= \pi b^2 k^1$; and if in equation (9), we put for z, $z + k^1$ we get

$$z = c - k^1 + \frac{\omega^2 r^2}{2g},$$

the equation to the free surface from the lowest point of the axis of the solid cylinder as origin.

And the volume of the fluid contained between two cylindrical surfaces at distances r and $r + dr$ from the axis $=$

$$2\,\pi r z dr = 2\,\pi r \left(c - k^1 + \frac{\omega^2}{r g} r^2\right) dr.$$

Hence the whole of this portion

$$=2\pi\int_a^b r\left(c-k^1+\frac{\omega^2}{2g}r^2\right)dr,$$

$$=\pi(c-k^1)(b^2-a^2)+\frac{\pi\,\omega^2}{4g}(b^4-a^4).$$

The whole volume, then, after rotation =

$$\pi\,b^2\,k^1+\pi\,(c-k^1)\,(b^2-a^2)+\pi\frac{\omega^2}{4g}(b^4-a^4),$$

and this equals the volume before rotation, viz.,

$$\pi\,b^2\,l-\pi a^2\,(l-k).$$

Whence we obtain, by equating these expressions and reducing

$$(b^2-a^2)\,(l-c)+a^2\,(k-k^1)=\frac{\omega^2}{4g}(b^4-a^4)\ldots\ldots(3).$$

Again; the pressure on the bottom of the solid cylinder is the only part that acts vertically, putting $\therefore z=k^1$ in (1).

$$p=\rho\left\{\frac{\omega^2\,r^2}{2}+g\,(c-k^1\right\}$$

is the pressure at any point at distance r from axis on bottom of this cylinder. Hence whole pressure on this end

$$=2\pi\int_o^a p\,r\,dr=2\pi\,g\,\rho\int_o^a\left(c-k^1+\frac{\omega^2}{2g}r^2\right)r\,dr$$

$$=\pi g\,\rho\,a^2\left(c-k^1+\frac{\omega^2}{4g}a^2\right)$$

$$=\text{weight of the solid cylinder}=\pi g\,\rho\,a^2\,(l-k)$$

$$\therefore c-k^1+\frac{\omega^2}{4g}a^2=l-k$$

$$\text{or }-(l-c)+(k-k^1)=-\frac{\omega^2}{4g}a^2\ldots\ldots(4).$$

Multiplying this equation by (b^2-a^2), and adding to (3), we get

$$b^2\,(k-k^1)=\frac{\omega^2}{4g}(b^4-a^2\,b^2),$$

or

$$k-k^1=\frac{\omega^2}{4g}(b^2-a^2,)$$

and $k-k^1$ is the depth that the solid cylinder sinks in consequence of rotation.

I am, Sir, yours, &c.,

A Constant Reader.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—Mr. Smith, in No. 1516, page 174, somewhat gratuitously characterizes "Workman" as slippery. No one, however, who has taken part in the discussions of the Exciseman's Staff Question has a better claim to that honourable title than himself, as I believe your readers will allow if they take the trouble to peruse the following remarks:

I will give him full credit for his disclaimer of appropriating to himself "Workman's" error, on which he "philosophizes" so much to his heart's content; and will merely follow him a little in his windings in and out in the general questions which he discusses.

It is no business of mine to defend "Workman;" however, I will do him the

justice to say, that he shows an accurate conception enough of the conditions of the problem; and he would, doubtless, have exhibited the equation of moments correctly had he trusted himself to investigate the values of the quantities X and Z himself, instead of extracting them from the *Lady's* and *Gentleman's Diary*.

Mr. Smith, it seems, is offended with "Workman's" expression,

"W. cos. β = resolved force of gravity *in direction* P D.

F. cos. β = resolved force of F *in direction* D P."

Perhaps he is not aware that any line parallel to the line of action of a force is called, in the language of mechanical science, its direction. I dare venture to say, that "Workman" had no such idea as Mr. Smith gratuitously attributes to him, that these forces act *in* the line P D.

On referring to Mr. Smith's own solution (page 406, No. 1502), we find these words, "Now the components of W and B *in the direction* of the axis are respectively W sin. θ, and B sin. θ." If, therefore, "Workman" has committed the error imputed, Mr. Smith has committed the very same.

Again; Mr. Smith gives two notable reasons (1) and (2) why "Workman's" equation (3) is absurd.

I shall best expose the absurdity of Mr. Smith's own reasons, by stating to him the fundamental doctrine of the action of forces on a solid body, which is the basis of all the equations, whether of rest or motion.

When any number of forces are applied to a solid body, there are two *tendencies* which have to be considered and reduced to mathematical calculation: viz., (1), a tendency to move *bodily* in a direction, and with an amount of momentum obviously depending on the magnitude and direction of the impressed forces; and, (2), a tendency of the body to *rotate* about some point in it: the former of these motions is called Translation, and the latter Rotation.

Now it is a well-known mechanical principle, which Mr. Smith will find in any good treatise, that the *tendency* to the motion of translation produced by any number of forces is the same as if these forces were all transferred to the centre of gravity, and were to act there in directions parallel to their lines of application. The tendency to *rotate* is the same as if the centre of gravity were fixed, and the forces acted merely to produce rotation about that point. These two principles, known as the principles of conservation of the motions of Translation and Rotation, are made the basis of the solution of a vast number of problems on the *motion* of solid bodies.

Now, evidently, if the body does not move, but is in equilibrium, each of these tendencies must be nil. There must be no *tendency* of the solid to move bodily, nor any tendency in it to rotate about any point.

The *resultant* of all the forces, therefore, so transferred to the centre of gravity, which measures the tendency to translation, must vanish, or, in other words, its *components* must separately be zero; and the resultant couple or moment which measures the tendency to rotation must also be zero. When the forces are all in one plane (as in the Exciseman's Staff Question), this necessity gives rise to three equations of equilibrium; the first two of which represent that the components of the resultant force vanishes, and the third that the resultant couple or moment vanishes.

"Workman's" equation (3), represents that the algebraical sum of the resolved parts of *all* the forces acting on the staff in the direction of its axis; that is, the component of the resultant force in that direction is zero. It is therefore "an equation of equilibrium," though not the sole equation; and it further represents this obvious fact, that the friction is equal and opposite to the resolved part of the resultant of the weight and fluid pressure in the direction of the length of the staff; which is, in fact, only putting the former truth in other words.

Hence, also, equations (1) and (2) of my solution, against which Mr. Smith urges the same objection, are correct, and exhibit *two* out of *three* the equations of equilibrium.

It is the result of a mathematical investigation, that when a solid body is at rest under the action of any forces, the algebraical sum of the moments must be zero *about whatever point* those moments are taken. It is therefore usual to take the moments about a point which offers some peculiar conveniencies; as, for instance, the point of application of one of the forces because the moment of that force vanishes. For this reason form-

ing the equation of moments about A, the point of application of the pressure on the staff, the friction which is one component of that pressure, disappears from the equation; unless Mr. Smith can show by some process, of which the world is at present in ignorance, that the distance of a point from the direction of a force *which passes through that point*, can be anything but *zero*.

Our two equations (1) and (2) might have been made to comprehend the conditions of equilibrium in both the *inferior* and *superior* limits by putting $\pm a$ for a. They would then have stood thus,

$$-\text{R sin.}(\pm a) + (\text{W}-\mu\text{V}) \text{ sin. } \beta = 0 \,..\, (1),$$
$$\text{R cos.}(\pm a) - (\text{W}-\mu\text{V}) \text{ cos. } \beta = 0 \,..\, (2),$$
$$\therefore \text{ tan. } \beta = \text{tan.}(\pm a) = \pm \text{tan. } a,$$

and it would appear by the same reasoning as I gave in my solution that the only value which satisfies the conditions of the problem is $\beta = a$, and *therefore* that there is no limiting state of equilibrium when the staff is on the point of slipping *upwards*.

And now one word as regards friction —the normal pressure is and must be independent of friction (and we shall see shortly that Mr. Smith himself so treats it), for the friction which is a force acting in the direction of the tangent *cannot* affect the value of a force acting perpendicularly to it. Moreover, it is the result of the experiments of M. Morin, and all the philosophers who have experimented on this subject, that friction bears to the normal pressure a ratio which is constant so long as the same surface, under the same conditions of unguent, &c., are in contact.

This ratio is called the co-efficient of friction; if not, let Mr. Smith tell us what co-efficient of friction is. The normal pressure and friction have, of course, a resultant, which in the state bordering on motion must be inclined to the normal at the limiting angle of resistance, which is the angle whose tangent is the co-efficient of friction.

In my equations I have used this resultant. I might have proceeded differently, calling P the normal pressure, and P tan. a the friction, the equations would then have stood as under

$$\pm \text{P tan. } a + (\text{W}-\mu\text{V}) \text{ sin. } \beta = 0 \,..\, (1).$$
$$\text{P} \quad - (\text{W}-\mu\text{V}) \text{ cos. } \beta = 0 \,..\, (2).$$

in which it is obvious that P not involving a on which the *friction* depends is independent of friction.

Let us now see how Mr. Smith treats this question in his solution. We read in No. 1502, p. 404, second column, "Let ϕ be the limiting angle of resistance of the surfaces at P;

$$(\text{W}-\beta) \text{ cos. } \theta$$

is the pressure at P producing friction,

$$\therefore (\text{W}-\beta) \text{ cos. } \theta \text{ tan. } \phi = \text{F}.$$

Now the *components* of W and β *in the direction* of the axis are respectively

$$\text{W sin. } \theta \text{ and } \beta \text{ sin. } \theta,$$
$$\therefore (\text{W}-\beta) \text{ sin. } \theta = (\text{W}-\beta) \text{ cos. } \theta \text{ tan. } \phi;$$
$$\therefore \text{ tan. } \phi = \text{tan } \theta, \text{ and } \phi = \theta."$$

Now in this *process*, which I strongly suspect he uses simply *as a process*, without understanding the physical facts which the several parts of it represent, Mr. Smith does precisely what we have done in our equations (1) and (2), and arrives at the same result, viz.,

$$\phi = \theta.$$

Here, however, was his proper place for introducing his ambiguous sign $\pm$, and he should have said

$$(\text{W}-\beta) \text{ cos. } \theta \text{ tan. } \phi = \pm \text{F},$$

and his result would have been

$$\text{tan. } \phi = \pm \text{tan. } \theta,$$

which is the same as any equation

$$\text{tan. } \beta = \pm \text{tan. } a.$$

This is quite sufficient to dispose of our slippery friend's remarks on friction, &c., which he evidently does not understand.

Again; to recur once more to his solution, he gives the result, which is quite correct,

$$\phi = \theta.$$

Now θ is the angle which the axis of the staff makes with the horizon, and ϕ is the *limiting angle* of resistance. Whence results inevitably this conclusion, that when there is equilibrium, the inclination of the axis of the staff to the horizon is equal to the angle of friction. In No. 1516, page 175, first column, the same Mr. Smith makes this profound remark: —" The most extraordinary mistake connected with the discussion of the Exciseman's Staff Question, are the attempts which have been made to prove that the *inclination* of the cylinder to the horizon is equal to the angle of friction between the surfaces at P; whereas it ought to be abundantly plain that the

latter depends *solely* upon the *nature* of the surfaces in contact."

Here is a slippery gentleman, indeed! Who can have confidence in the "philosophizings" of a man who employs a process which is equivalent to the exhibition of two equations, which he characterizes as absurd, and who stumbles on a conclusion which he cannot apparently interpret, and which he afterwards states to be "the most extraordinary mistake connected with the discussion" of the question?

Mr. Smith evidently imagines that, because he can string together a few well-rounded periods, with high-sounding philosophical terms scattered here and there like plums in a pudding, can invoke the shades of Archidamus, and make himself merry at the expense of a "coterie of amiable gentlemen," that he is, therefore, a profound mechanical philosopher. Let, however, that facetious gentleman be assured that something more goes to make a philosopher, and among other things, a knowledge of the principles of science.

Notwithstanding that Mr. Smith is likely to remain long enough before any knot of amiable gentlemen will complacently reciprocate with him the title "Distinguished Mathematician," yet I will withdraw the term "villanous," which he deems offensive, and adopt the term "amiable," which seems more to his taste.

I cannot conclude without exposing one glaring act of unfairness towards "Workman," which may save that gentleman some pains should he think it worth while to trouble himself with Mr. Smith's remarks. Mr. Smith exhibits three equations of "Workman" thus

$$\text{Eq. (1.)} \quad W = F + R$$

$$\text{Eq. (3.)} \quad W = F$$

$$\text{Eq. (6.)} \quad W = F\,\frac{X + Z \cot.\beta}{x + r \cot.\beta},$$

and comments on the absurdity of the co-existence of (1) and (2).

Now, "Workman's" equation (3) stands thus

$$\mu\,(W - F)\sin.\beta + F\cos.\beta = W\cos.\beta \quad (3.)$$

from which he draws the conclusion

$$\cot.\beta = \mu \ldots\ldots\ldots (4),$$

expressly excluding the solution which results from putting the factor $(\omega - F)$ equal zero,

$$\text{or } W = F.$$

Mr. Smith himself gives this equation

$$(W - B)\sin.\theta = (W - B)\cot.\theta\tan.\phi,$$

which is the very same as "Workman's" equation (3), and draws the conclusion from it

$$\phi = \theta.$$

It is as fair to say that he exhibits an equation

$$W = B,$$

as that "Workman" does.

This unfairness towards an opponent—an opponent, too, who has treated him so mildly—surpasses anything of the kind which the most infuriated bigot, not to say philosopher, ever practised.

I am, Sir, yours, &c.,

INDAGATOR.

Sept. 16, 1852.

P.S. Having seen "Workman's" defence and correction of his solution, I confess that it would have been more satisfactory had he given some *reason* for taking the pressure on the rod vertical. As it seemed to me that he was solving the problem on general principles, by the use of the common equations of equilibrium, I could not admit that he was correct in assuming the pressure *in the direction of the prop*, which, in most problems of the nature, is far from being the case.

In the Exciseman's Staff Question, the total pressure is *vertical*, as appears from the solution of the equations (1) and (2), viz.,

$$\beta = \alpha.$$

It is a well-known principle that, if a rigid body be kept in equilibrium by three pressures, the directions of these must be either parallel or meet in a point. Two of the forces acting on the Exciseman's Staff, viz., its weight and the fluid pressure, are vertical; hence the pressure on the staff which is in equilibrium with these is vertical also. Hence (fig. page 185)

$$\text{KAR} + \text{CAE} = 90^\circ \quad \alpha + 90^\circ - \beta = 90^\circ,$$

$$\text{or} \quad \beta = \alpha.$$

And there remains only the equation of moments.

This mode of looking at the problem also furnishes at once the most satisfactory answer to Mr. Smith's statement, that there must be *two* limiting positions of equilibrium. For since the pressure must be *vertical*, it must act *upwards*, and therefore can only lie on *one side* of the normal AN.

Had "Workman" solved his problem on the above principle, I should not have conceived him in error. I have probably misapprehended him; but as his words certainly gave the idea that he supposed the pressure to act *in the direction of the prop*, my misapprehension was not unreasonable, especially as there is no statement of his which leads us to suppose that he assumed the pressure vertical on the grounds I have stated above.

For the rest, "Workman" will perceive that I have done him ample justice in the remarks I have made on Mr. Smith's last effusion—an effusion which I should not have noticed for its intrinsic merits, but through fear that it might mislead some unwary persons. I take this opportunity of stating that it is not my intention to enter into further controversy with that gentleman, inasmuch, differing, as we apparently do, on the most fundamental and elementary notions, there seems no reasonable prospect of coming to an agreement.

I.

ON THE CONNECTION OF ATMOSPHERIC IMPURITY WITH DISEASE. BY HENRY M'CORMAC, ESQ., M.D., OF BELFAST.

(Read before the British Association.)

In the observations I am about to make, the subject may be said to resolve itself into one of bodily health, or well-being; or the best means of avoiding those departures from integrity, and soundness, which we term disease. On the part of all classes, high, low, rich, poor, there is a great, though, of course, varying departure from the conditions essential to the preservation of health. How many must there be who cannot lay claim to a sound mind in a sound body? The greater the perversion, the easier, also, is the gradation towards worse; yet such is the precariousness of existence, that, owing to the want of care and forethought, perchance hard necessity, individuals, naturally well-endowed, too often suffer disease and death, sooner and more readily than persons of comparatively inferior stamina. There is not a point of physical education which is not neglected.—There is not an individual of whatever age, whatever sex, whatever station, that should not take a daily morning bath; more or less exercise the upper, as well as the lower extremities; the lungs, also, in the open air, and day and night respire an atmosphere of irreproachable purity. That these conditions severally so indispensable to the fundamental requirements of organic life, are not adequately fulfilled, I appeal to the ordinary experience of the least reflecting individual. I have gone, for example, into each of the apartments where the different Sections of this great beneficent Association are daily in the habit of meeting, and have found the atmosphere unfitted for healthy respiration, whether as regards assemblages like the present, or the ordinary requirements of academic life. Who would believe, that in a large, flourishing, intelligent town like Belfast, and in the very face of an approaching pestilence, a black, sewer-like stream, worse than the London Fleet, should be suffered to pollute the air with exhalations the most virulent and intolerable? My conclusions, indeed, are stringently and unconditionally urged, but if so they are the result of much experience as well as of protracted earnest inquiry.

I desire to present in a brief, perspicuous form, the result of my inquiries as to the connection of atmospheric impurities with disease. Strictly speaking, there is no natural impurity, except *malaria*, presumably the result of the decomposition of vegetable remains, aided by a certain amount of warmth and moisture. This it is which gives rise to the whole tribe of periodic disease, from the simple intermittent, or ague, of temperate climates, to the destructive remittents of the torrid zone. Of these last, yellow fever is a striking form. The attempts made in recent, as in former years, to ascribe it to infection, have, in my opinion, been unattended with the slightest success. Putting aside typhus fever, with which we must take care not to confound it, yellow fever is simply a set of symptoms induced by the respiration of air rendered poisonous by the products of vegetable decay.

We know nothing of the sources of small-pox, measles, scarlet fever, plague, or cholera, but we do know that their severity is frightfully aggravated, and their frequency incalculably increased, by crowding, want of ventilation, insufficient cleanliness—in short, everything that renders air impure and stationary, a nursery for the leaven or ferment which, being taken into the lungs, leavens the whole system and reproduces the complaint.

The number of instances in which typhus fever ensues from casual causes, as cold, wettings, over-effort, rather than infection, is comparably few. For practical purposes, indeed, it might almost be assumed that fever had no other source than infection. Nervous relapsing gastric, typhus, typhoid, continued, and essential fevers, so termed, are the same. There is not, in fact, the

specificity about typhus which has been asserted. It is simply the result of dirt, crowding, and foul air. There is the important distinction between this malady and the febrile exanthems, that no degree of crowding, however it may aggravate, gives rise to them, whereas the poisonous atmosphere from human contamination, carried a certain length, is competent to produce fever at any time.

If persons not labouring under fever, by reason of the impurities emanating from their persons, be able to poison the atmosphere as to entail fever in themselves or others, it follows yet more cogently that persons who *do* labour under fever shall thus reproduce the complaint. In point of fact they do reproduce it, and thus it is that fever comes to abound. When the air, however, is maintained perfectly pure, the fever-poison either is not created, or, if created, becomes so diluted as to prove insufficient to the production of further mischief. If fever spread, then, it may be fairly taken for granted that there has not been a sufficient observance of hygienic precautions. The air has not been renewed, sufficient purity has not been observed. Such is the immensity of the mighty ocean of the atmospheric that it suffices for the removal of every impurity, if we only resort to the wise yet simple precaution of instantly replacing the portion that we consume. To breathe a polluted atmosphere, when we have it so completely at our disposal to avail ourselves of that which is unpolluted, is a monstrous error. It is as if one might have fair water from the spring were to consume soil and impurity instead.

The epidemics of the middle ages, as well as the febrile and cholera epidemics of more recent times, yield, I conceive, forcible evidence as to the truth of these averments. The people in those days, as much too often in these, lived with little regard to the exigencies of their position. There was no adequate provision for personal or household cleanliness—none for the introduction of pure air into the dwellings. It is not, perhaps, too much to assert that these epidemics are but another name for a foul, unrenewed atmosphere.

The production of typhus from the effluvia of human beings plunged in dirt and misery will not, indeed, ensue unless those effluvia be concentrated to the requisite degree of virulence. Still, these effluvia, coupled with aerial impurities generally, are not the less productive of other maladies or diseased conditions, directly or indirectly calculated to shorten life. And first and foremost of these diseased conditions, are what are called phthisis and scrofula. Phthisis, or consumption, is merely tuberculous deposit, with conditionally-accruing inflammation internally, while scrofula is tuberculous deposit, with the like inflammation externally. As tuberculous deposits are most frequent in the lungs, it is to this state the term consumption is most frequently applied. In other respects, the bowels, brain, the bones and joints, are all liable to tuberculous disease.

Dyspepsia, or indigestion, is so frequently the attendant of tuberculous degeneration, as, by many, to have been looked upon as a sort of necessary precursor. Confinement, a deteriorated atmosphere, want of sufficient bodily effort, and more especially, the absence of full and free respiration in the open air, with the necessary impairment of appetite and digestion, are quite enough to account for the concomitance of tubercle and dyspepsia, without referring the one to the other in the order of cause and effect.

The respiration of foul, unrenewed air, I look upon as the only source of tubercle, including, under this designation, both phthisis and scrofula. Unless foul air be respired, there can be no consumption, no scrofula. If an individual live constantly, day and night, in the open air, or in air of equal purity with that subsisting in the exterior atmosphere, he cannot incur consumption. There are no consumptive gipsies or Bedouins, so long, at least, as they preserve their aboriginal out-of-door usages, or are not subjected to confinement or ill-treatment. Consumption from the respiration of mineral dusts, besides its exceptional character, is comparatively rare, and even here, an atmosphere otherwise deteriorated, is among the destructive agents actively at work. As for hereditary consumption, making due allowance for the few individuals born tuberculous, and for the greater proneness, under like circumstances, of those sprung from diseased progenitors, to disease, there is no such malady.

In-door pursuits are very much more frequently attended by consumption than out-door ones. And were it not for the atmosphere of the pestiferous bed-room, crowded with occupants, and destitute of every provision for the healthy renewal of air, those of the working classes who follow out-door occupations would escape very much better than they do. It may readily be imagined then, that when in-door pursuits are coupled with foul air in sleeping-rooms, the result must be doubly disastrous. In fact, they are so.

Unless there be atmospheric purity, consumption is just as frequent in warm climates as in cold! Intercurrent pneumonia and pluritis, indeed, will be less frequent;

not so, however, phthisis. Those warm climates, in which consumption is really less frequent than in cold, derive the comparative immunity simply from the people being forced, by the great heats, to live more in an unpoluted atmosphere. If the inhabitants of Great Britain and Ireland would but consent, day and night, to live in a pure untainted atmosphere, it would put a total close to the ravages of consumption! It is not sending people to warm climates that averts or cures consumption. It is sending them to pure air, in so far as they are so sent, that does so, and this only. To confine consumptive persons in close heated apartments, is but to hasten the ravages of their disease. On the contrary, they should live as much as possible in the open air. Let us keep the consumptive in pure fresh air, and we shall at once realise a Pau, a Nice, a Madeira, better than any Pau, or Nice, or Madeira, without fresh air. And better still, let us live in a pure unadulterated atmosphere, or in air equally pure as the open, unadulterated atmosphere, and we shall have no consumption whatever! It is quite illusory to think of curing the consumptive by means of food, or even medicines, without the amplest access to the free fresh air. An ounce of oxygen is worth a ton of fish-oil or iodine, or any amount of wire air-sieves for mouth or nostril.

The dirt and sordes amid which the poor habitually live bespeak sufficient condemnation. The senses take the alarm, and sympathy and horror are in unison with our best judgments. These monitors, however, are at fault in the dwellings of the rich. There perfumes regale the nostrils—rich hangings solace the eye. Nevertheless, it is undoubted that atmospheric impurity in the dwellings of the rich, however it may fail to obtrude itself on the senses, it is only inferior in virulence and destructiveness to what it proves in the dwellings of the poor. That it is so, let the dreary catalogue of persons of all classes yearly swept away in these islands by consumption, declare!

The remedy for this defective state of things is the improved condition of our domestic atmosphere. In a treatise styled "Moral-Sanatory Economy," I have pointed out various means of securing this important consummation. I would here, however, signalize an error of some importance—namely, that ventilation does not signify mere draughts. People hate draughts, and justly. There should be ventilation; but, as regards cold-air ventilation and warm-air ventilation alike, there should be no appreciable, certainly no appreciably injurious or disagreeable draughts. It is one of the very great advantages of French casements that they open completely at pleasure, so as to yield a perfect mass of fresh air, irrespective of draughts. They permit windows also to be cleaned from the inside without risk, and, at the same time, ensure copious and most desirable supplies of light. It would be very easy, however, to make our common casements, which now only open one-half, to open completely, and to draw down as well. In other respects, coupled with perfect purity of the domestic atmosphere, there should be warm fires, warm clothing, and the amplest supplies, during the cold season, of masses of air heated to a moderate temperature.

Next to the importance of pure air within the house, comes that of pure air without. An improved culture amends climate. Drainage should be good, while all impurities should be removed on the instant. Day and daily the process of lustration should go on, if we would get rid of foul air and the evils which follow in its train. It would be worthy of the intelligence of the age, if means and measures could be devised for removing day by day all those impurities, whose presence so impairs the healthy sustentation of animal life. A recent writer, among other strange paradoxes, hints that it is not desirable that people should become too healthy, lest, forsooth, they should cumber the earth! Fewer births, however, it is now known, ensue in healthy, as contrasted with unhealthy communities. It would, in truth, be an insult to common sense to suppose that a healthy, intelligent community, even within moderate limits, should not be preferable to one swarming with numbers, disease, and only vying in barbarism and wretchedness.

THEORETICAL REMARKS ON THE STRUCTURE OF IRON. BY J. N. V. FUCHS.

(Translated for the "Mechanics' Magazine" from "Poggendorf's Annals of Physics and Chemistry.")

The physical properties of iron differ considerably according to circumstances. Some species present also very striking differences in their chemical composition. It is well-known that no species of iron is really pure. The most prominent of the substances commonly found combined with iron is carbon, which is always present in a greater or less quantity, and is nearly always accompanied by silica; which may possibly fulfil partially the same functions as carbon. Fuchs directed his investigations more particularly to carbon; this substance is found in greatest quantity in pig-iron (particularly in the sort called *à facettes*), *fer miroirtant*, and in

the smallest quantity in bar iron, steel may be placed between these; in none, however, is a constant proportion between the iron and carbon maintained, and it is impossible, therefore, to give an exact classification of the different sorts of iron according to the quantity of carbon contained in them, which appeared to prove that the combination of carbon and iron cannot be a really chemical combination. We may not, however, infer from this that the different conditions of this metal depend only on the larger or smaller proportions of carbon contained therein, and this has been entirely confirmed by a number of very interesting analysis made by M. Fuchs of the different sorts of iron. Persons desirous of becoming acquainted with the nature of various descriptions of iron, which differ so much in other respects, have by merely directing their attention to the quantity of carbon contained in iron in its different states, have generally overlooked another essential property or consideration, viz., the *crystallization*. M. Fuchs is of opinion that iron is a *dimorphous substance*, presenting itself under two distinct generical forms or systems of crystallization; viz. the *tesseral* or the *rhomboidal* (or its modification, the *hexagonal*); and, consequently, there may be said to be two classification species of iron, which may be distinguished as tesseral and rhomboidal iron, and which are sometimes found combined in different proportions. M. Fuchs's experiments have proved decisively that the malleable or bar-iron belongs to the tesseral crystallization form, and it may be conjectured that all the malleable metals may be classed under that system of crystallization. The crystallization system of pig-iron is not so exactly determined, but it is very likely that it belongs to the rhomboidal system, because facette iron particularly is one of the perfectly brittle metals which generally belong to the rhomboidal form. The difference between bar and facette iron is based not only on the difference of the system of crystallization, but also in the great difference between their physical and chemical properties; such as the tendency of the molecules of metal to burst, and become displaced; hardness, liability to oxidation, solubility, fusibility,* &c. M. Fuchs is of opinion that steel is an alloy of tesseral and rhomboidal iron; and he thinks that hardening and tempering consists only in the transformation of all the molecules, or a portion of them from one system of crystallization to the other; the rhomboidal iron being predominant in hardened steel, and the tesseral in non-hardened steel.

* M. Wohler has already directed attention to the fact that every dimorphous substance has two different degrees of fusibility.

SUCCESSFUL APPLICATION OF THE ROTARY ENGINE TO STEAM NAVIGATION.

We extract from the *Nautical Standard* the following particulars of a recent trial trip made by the *Henry Wimshurst*, a small steamer about 265 tons. The vessel is fitted with a screw-propeller, driven by Mr. Wimshurst's patent rotary engine; the performances of which at the coal-pit of the Butterley Company in Derbyshire, we have already noticed—(See vol. lv., p. 281). The results of the present trip are a decided confirmation of the favourable opinion we then expressed of this engine; and the inventor is sanguine of attaining still more satisfactory performances, the present engine being the first yet set to work.

The following particulars show the distance run, and time occupied:

Saturday, August 28, 1852.

11h. 20m.—Hauled out of the East India Docks, the engine making 52 revolutions per minute.

12h. 47.—Started from Blackwall-stairs. The General Screw Steam Shipping Company's vessel, the *Indiana*, left the East India Docks on a trial trip; she had more than half a mile start of us, but it was soon apparent that we were over-hauling that gigantic and powerful vessel.

1h. 2m.—Abreast Woolwich Dockyard clock, the engine making 60 revolutions per minute.

1h. 35m.—Passed the *Indiana* off Erith.

1h. 48m.—Arrived at the measured mile, which was run against tide and a strong wind in 5m. 10s.=11·6 knots, or 13·36 statute miles per hour; making 65 revolutions per minute.

2h. 10m.—Off Grays.

2h. 20m.—Off Gravesend church clock, making the distance run to Gravesend 20 miles in 1 hour and 33 minutes.

2h. 33m.—Off Cole-house Point.

3h. 37m.—Two miles west of the Nore Light, making a distance of 39 miles from Blackwall in 2 hours and 50 minutes= 13·74 miles per hour, at this time the *Indiana* was about 6 miles astern, we then turned round and run back against the ebb-tide, the vacuum gauge indicating only 10lbs. of steam.

3h. 52m.—Met the *Indiana* running down with strong tide in her favour.

5h. 40m.—Arrived off Gravesend against tide.

6h. 5m.—Started up from Gravesend, and

ran up the measured mile; which was done in 7 minutes 8·57 knots, or 9·92 miles against a strong tide and wind, the engine then making 64 revolutions.

8h. 0m.—Arrived off Blackwall, the distance from Gravesend, 20 miles, was accomplished in 1h. + 55m. against tide.

August 31, 1852.

12h. 40m.—Again started from Blackwall, against a flood tide.

2h. 20m.—Off Gravesend church clock, took in coals at the lower part, off Milton.

3h. 50m.—Started up against tide and wind.

5h. 40m.—Arrived off Blackwall, doing the distance in one hour and fifty minutes, no stoppages required either way, with 8 lbs. vacuum and 10 lbs. steam in the boiler.

It may be considered by some parties that this is not very great speed, when compared with our fast, but very light Gravesend steamers; it is therefore necessary to give the comparative dimensions of this vessel. Length, 135 feet; beam, 21 feet; depth of hold 12·6, and drawing about 11 feet of water; the sectional area in midships 132 feet. Whereas, the fast Gravesend boats do not present a greater sectional area than about 70 feet, and their angle of water line is as fine as a knife, as compared with the *Henry Wimshurst*. The full power of the improved engine can hardly yet be exactly estimated, as much greater speed will be accomplished, even with a smaller consumption of fuel, which is not at present more than 4 cwt. per per hour.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING SEPTEMBER 20, 1852.

Enrico Angelo Ludovico Negretti and Joseph Warren Zambra, both of Hatton-garden, meteorological instrument-makers. *For improvements in thermometers, barometers, gauges, and other instruments for ascertaining and registering the temperature, pressure, density, and specific gravity of aëriform fluids and liquids or solid bodies.* Patent dated March 8, 1852.

The patentees describe and claim—

1. A mode of constructing registering thermometers by choking or partially closing the aperture of the tube at or near the bulb, so that, although the mercury can freely expand under the application of heat, it will not be capable of returning to the bulb when that heat is removed, but, by remaining stationary, will indicate the degree of highest temperature. The choking or partially closing the tube may be effected by introducing a short piece of wire, or by bending or twisting the tube. In order to ensure greater accuracy in the graduated scale, the patentees mark it on the glass tube itself, which they make of a flat form to enable this to be done the more readily.

2. A pocket barometer, which consists of a vacuum thermometer tube, having a flexible bulb composed of thin glass, platinized silver, or other suitable material containing mercury, by the compression of which in the flexible bulb the density of the atmosphere is indicated. A thermometer is combined with the instrument, to enable the necessary correction to be made for the expansion of the mercury by an increase of temperature.

3. A self-registering barometer, in which the indications are given by indexes moving in supplementary short tubes placed by the side of the main tube (which is similar to that of a syphon barometer), and connected therewith by branches. The supplementary tubes are, of course, open to atmospheric pressure.

4. An improved water-gauge for boilers. This instrument consists simply of a thermometer, by which the boiling point of the water in the boiler is indicated, and as this varies according to the density of the water, the engineer will be able to ascertain when that density approaches a point which would render the generation of steam dangerous, and will, consequently, make suitable provision against contingencies by "blowing off" until the density of the water is sufficiently reduced.

5. An instrument for ascertaining the specific gravity of liquids by their expansion at certain ranges of temperature.

Uriah Scott, of Grove-street, Camden-town, engineer. *For improvements in wheels and in springs and spring-bearings for carriages.* Patent dated March 8, 1852.

The "improvements in wheels" consist in the application or interposition of India-rubber, cork, or other yielding material between the axle-box and nave of the wheel, in order to isolate them from each other, and prevent the transmission of concussions.

The "improvements in springs" consist in constructing the same so as to obtain the requisite elasticity from the contractile force of blocks or tubes of vulcanized India-rubber subjected to tensile strain—the blocks or tubes being formed with suitable projections to admit of their being held between clips, and pieces of metal being used to prevent their slipping from the clips when thus held.

The "improvements in spring-bearings

for carriages" consist in forming bearings or supports for carriages by the application of vulcanized India-rubber in combination with suitable boxes or apparatus, and with or without ordinary springs; the object being to prevent the effect of concussion and to lessen vibration.

Augustus Turk Forder, of Leamington Priors, Warwick, solicitor. *For an improved fender.* Patent dated March 8, 1852.

This improved fender is intended as an appendage to railway engines and carriages, and is so constructed and arranged as to absorb any probable amount of force which may be exerted against it in the event of a collision on a railway. The fender is attached to the carriages, and all injury to them is prevented by causing it to receive and absorb the whole force of the shock.

Claim.—The improved fender, substantially as described.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of Fleet-street, patent-agents. *For improvements in presses and in pressing.* (A communication.) Patent dated March 8, 1852.

Claims.—1. The combination, in a peculiar manner described, for pressing purposes, of the two forces derivable from the equilibrium of fluids and from centrifugal force.

2. A peculiar arrangement of pressing machinery.

Walter Young, of Springfield Iron-works, Salford, Lancaster, millwright and engineer. *For an improvement or improvements in steam engines.* Patent dated March 8, 1852.

Mr. Young's invention consists in a "peculiar arrangement, combination, and mode of action" of the parts of double cylinder engines as applied to stationary and marine purposes.

Pierre Henri Bareau, of Paris, manufacturer. *For certain improvements in the manufacture of carpets, velvets, and other fabrics.* Patent dated March 8, 1852.

Mr. Bareau's improvements are exemplified as applied to a loom of peculiar construction for weaving piled carpets and other fabrics. The claims are for—

1. The moveable warps serving each to make one or several transverse lines of the fabric.

2. The descending reeds introducing between the threads of the fixed warp, the woollen threads forming the visible part of the tissue.

3. The use of small nippers in connection with the moveable warps and the descending reeds, or with each separately, and serving to hold the woollen threads.

4. The use of large nippers in connection with the moveable warps and the descending reeds, or with each separately serving to hold the extremities of the threads and keep them on the stuff.

5. A mechanical arrangement or guide which, used in connection with the moveable warps and descending reeds, or with each separately, enables the workman to change the point of introduction of the woollen threads across the threads of the ordinary warp, the change of which is only obtained by the removal sideways of the fixed warps.

Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. *For improvements in machinery for combing wool and other fibrous substances.* (Being a communication.) Patent dated March 8, 1852.

Claims.—1. The general arrangement of machinery described for combing wool and other fibrous materials.

2. Giving to the feeding apparatus a peculiar motion for the purpose of depositing the fibres of wool on to the teeth of the main comb.

3. In combination with feeding rollers thus operated, the employment of a lifting-rod for lifting the fibres preparatory to depositing them in the main comb.

4. In combination with the feeding roller and lifting-rod, the employment of a vibrating comb for the purpose of efficiently separating the fibres held by the feeding rollers from those deposited on to the teeth of the main comb.

5. In combination with an endless chain of comb teeth constituting the main comb, the use of a vibrating finger to direct the fibres of wool (after having them combed) to the draw-off rollers, which deliver them to the condensing apparatus.

6. Giving to the feeding rollers an intermittent motion that the required quantity of wool may be fed forward, and remain at rest during the combing action.

7. Giving to the draw-off rollers which strip the fibres of wool from the teeth of the main comb a slow motion in the direction of their axes.

John Henry Johnson, of Lincoln's Inn-fields. *For improvements in weaving carpets and other fabrics, and in machinery or apparatus employed therein.* (A communication.) Patent dated March 8, 1852.

This invention comprehends—

1. A mode of actuating the trap and knot boards of looms so that the second row of heddles shall rise higher than the first, the third higher than the second, and so on throughout the series, the object being to ensure that all the threads in a shed, when

the warp is sprung, shall be in the same plane.

2. A mode of introducing and withdrawing the pile wires by means of a vibrating quadrant, having a groove in which the wire is held by a roller while in the act of being inserted and drawn.

3. A mode of locking the warp beams when the lathe beats up, and releasing it at the moment the lathe leaves the cloth.

4. A mode of actuating the picking sticks by means of springs, which are pressed out by cams, and when released spring in, and by their impetus cause the working of the picking sticks, and throwing of the shuttle.

Paul Rapsey Hodge, civil and mechanical engineer, of Adam-street, Adelphi. *For certain improvements in the construction of railways and railway carriages; parts of which are applicable to carriages on common roads.* (A communication.) Patent dated March 8, 1852.

The patentee describes and claims,

1. The application of a galvanic or electro-galvanic current to the rails of railways, in order to prevent oxidation of the metal of which they are composed.

2. An arrangement of moveable points in which springs are used to bring the shifting parts in close contact, so as to ensure a firm tread of the wheels.

3. An arrangement of springs for railway carriages, in which India-rubber springs are combined with ordinary springs, and with a cross-head and links.

4. An arrangement of steam spring and lifting apparatus for railway carriages.

5. Several improved forms of axle boxes with double oil or grease chambers.

6. A mode of constructing railway carriage wheels with rings of India rubber interposed between the sides of the nave of the wheel and collars formed on the axle, for the prevention of lateral vibration or jar.

7. An improved form or forms of metal railway wheels.

8. An improvement in the wheels of carriages to be used on common roads, which consists in interposing rings of India rubber between the axle-box and nave of the wheel, so as to prevent lateral and vertical shocks, and deaden the noise produced when the wheel is travelling over uneven surfaces.

Alexandre Hediard, of Rue Taitbout, Paris, gentleman. *For certain improvements in rotary steam engines.* Patent dated March 8, 1852.

Mr. Hediard's rotary engine is composed of three circular plates or discs set close together, the centre one being keyed to the main shaft, which passes through bearings formed in the side plates. These side plates having each a circular groove at or near the edge, which grooves coincide and form a continuous channel, which constitutes the steam chamber. A piston or projection is formed on the periphery of the centre disc, which fits into the channel, and traverses the same when urged by the pressure of steam. There is a steam port and exhaust, and a valve in the channel between the ports, which acts as a steam stop, but is free to rise and fall, to allow of the piston passing it. When steam is admitted into the channel, the piston is forced to travel round therein, and, being a fixture to the disc which is mounted on the main shaft, that shaft is caused to revolve, and its motion may be taken off and applied in any desired manner by the usual kinds of gearing.

Claim.—The combination of the mechanical organs described for the construction of a rotary engine.

Benjamin Goodfellow, of Hyde, Chester, engineer. *For improvements in boilers for generating steam.* Patent dated March 11, 1852.

These improvements consist in constructing tubular boilers with bent tubes, through which the flame and products of combustion of the furnace pass to the chimney. The tubes are bent into a semicircle or other convenient form, and are secured in the plates of the boiler by ferrules, or by expanding the ends of the tubes.

Claim.—The combination of such bent tubes with plates to form a boiler.

Colin Mather, of Salford, Lancaster, machine-maker, and Ernest Rolffs, of Cologne, Prussia, gentleman. *For certain improvements in printing, damping, stiffening, opening, and spreading woven fabrics.* Patent dated March 11, 1852.

Claims.—1. The employment, as applied to "surface printing" machines, of a roller or rollers, which convey the colour to the printing cylinder or cylinders direct, that is, without the intervention of furnishing rollers or blankets.

2. The employment of a stationary table or tables, against which the printing surfaces are caused to act.

3. The construction of the rollers or cylinders, to receive devices for surface-printing, by placing washers or discs of paper or other suitable material on a shaft or mandril.

4. The employment of a cylinder, in combination with a "doctor" or its equivalent, for conveying moisture or stiffening matters to woven fabrics by contact.

5. The use of revolving discs for opening and spreading woven fabrics.

The Duke of Kent.—A perfect "Koh-i-noor" in the science of ship-building has just been added to the treasures of the Painted Hall, at Greenwich Hospital, in the shape of an elegantly-mounted model of a four-decked 170-gun ship, of 3,700 tons burden, which was planned 43 years ago by the late Mr. J. Tucker, one of the "old school" surveyors of the navy. It is not only in itself a beautiful work of art, both as to planning and execution, but also an appropriate and much to be commended example of monumental architecture, from having been presented by the widow of the planner, and honoured by its accipients—the Commissioners of Greenwich Hospital—with a conspicuous standing in the noblest part of the most nationally interesting establishment of Great Britain, the strength of which rests so forcibly upon the efficiency of her wooden walls.—*United Service Gazette.*

WEEKLY LIST OF NEW ENGLISH PATENTS.

John Macintosh, of New-street, Surrey, civil engineer, for improvements in manufacturing and refining sugar. September 18; six months.

James Pillans Wilson, of Belmont, Vauxhall, Surrey, gentleman, for improvements in the manufacture of cloths, and in the preparation of wool for the manufacture of woollen and other fabrics, and in the preparation of materials to be used for these purposes. September 18; six months.

John Mitchell, of Calenick, Cornwall, for improvements in purifying tin ores, and separating ores of tin from other minerals. September 18; six months.

William Smith, of Little Woolstowe, Bucks, farmer, for improvements in machinery for reaping. September 18; six months.

George Hutchinson, of Glasgow, merchant, for a method of preparing oils for lubricating and burning. September 18; six months.

James Warren, of Montague-terrace, Mile End-road, and Barnard Peard Walker, of North-street, Wolverhampton, for improvements in the manufacture of screws and screw keys, and in the construction of bridges, applicable to floorings, roofings, and paving. September 18; six months.

Moses Poole, London, gentleman, for improvements in combining caoutchouc with other matters. September 18; six months.

Francois Mathieu, of Hatton-garden, Middlesex, gentleman, for improvements in apparatus for containing aerating, refrigerating, filtering, and drawing off liquids, and in ornamenting such apparatus. September 23; six months.

John Lawson and Edward Lawson, both of Leeds, machine makers, for improvements in machinery for scutching and cleaning flax straw. September 23; six months.

Jacques Leon Tardieu, of Paris, gentleman, for certain improvements in the colouring of photographical images. September 23; six months.

Robert Bowman Tennent, of Gracechurch-street, London, merchant, for certain improvements in the mode of pulping cherry coffee, and in the machinery applicable thereto. September 24; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Sept. 17	3371	E. D. Stones	Sheffield	Somacephalic bath.
,,	3372	J. Carrington	Potton, Bedfordshire	Girth.
18	3373	J. W. Ingram and Co.	Birmingham	Printing press.
,,	3374	J. C. Meredith	Birmingham	Clog fastener.
23	3375	C. Dain	Southampton	Perpetual daily indicator.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Sept. 16	467	Mrs. T. Groom	Walworth	Elastic waistband.
,,	468	Mrs. T. Groom	Walworth	Elastic belt.
18	469	P. D. Nolet	Holborn	Travellers' copying-press.
20	470	J. Smith	Islington	Railway carriage wheel-lock.
,,	471	A. Hely	Westminster	Hand-churn and egg-beater.

CONTENTS OF THIS NUMBER.

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Edited by R. A. Brooman, 166, Fleet-street.

GRIFFITHS'S IMPROVED SCREW PROPELLER.

Fig. 1.

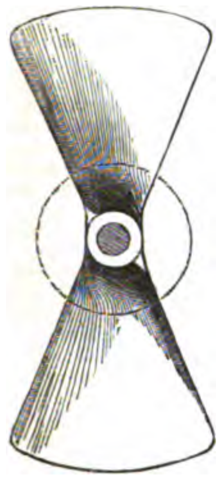


Fig. 2.

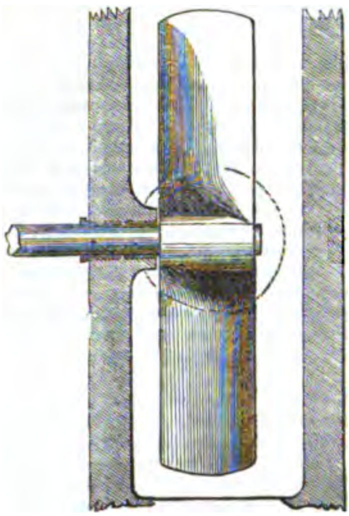


Fig. 3.

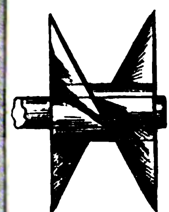


Fig. 5.

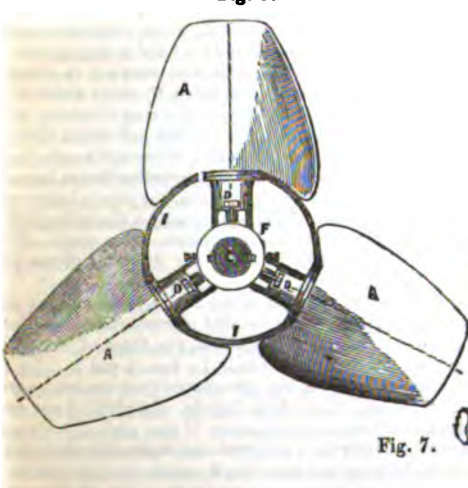


Fig. 6.

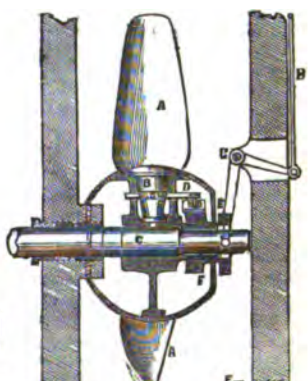


Fig. 7.

GRIFFITHS'S IMPROVED SCREW PROPELLER.

(From a Paper by Mr. G. H. Bovill, read before the Institution of Mechanical Engineers, Birmingham, July, 1852.)

The Screw Propeller has now become so important a feature in steam navigation, that the writer has thought it a subject of sufficient interest to induce him to bring under the consideration of the Members of the Institution of Mechanical Engineers, as well as the owners of screw vessels, some most important experiments made under his own directions upon a new propeller, invented and patented by Mr. Griffiths, which is in its form and general principles diametrically opposite to the screws adopted by the Government, and by all the marine engineers of the present day.

The screws generally used (as shown in figs. 1, 2, and 3,) are formed of two blades, continued down to the shaft, the boss or centre being reduced to the smallest possible size consistent with strength. The Government, by their elaborate experiments with the *Rattler*, *Minx*, &c., appear to have determined thus far the general outline of principles for constructing the screw, but the correct pitch, diameter, and length, as well as the number of blades necessary for obtaining the best results, are still matters upon which scarcely two engineers agree, and the equally important point, the correct speed to drive the screws, is a still greater matter of doubt; and, notwithstanding the great labour and expense that have been bestowed on the subject by many engineers of eminence, to whom we are indebted for bringing the subject to its present state of practical utility, yet there appear no fixed and certain rules arrived at for constructing the screws and determining the speed at which they shall be driven to produce a given result. On reference to Mr. Murray's valuable work on Steam Vessels and the Screw, it will be found, on comparing the various vessels in her Majesty's Navy, that the most singular circumstances occur in the comparative proportions of screws, as well as the speeds expected from the engines, compared with the actual revolutions obtained on trial.

In the year 1849, Mr. Griffiths explained to the writer his then crude notions for removing the defects in the ordinary screw. The idea was so original, and appeared to him so correct, that he at once instituted a series of experiments, which proved to him the great importance of the invention, and induced him to make further experiments, which he believes will have removed the uncertainty and objections that surround the ordinary screw, thus rendering its future application and results as certain as the paddle-wheel.

The construction of the new Propeller is shown in figs. 5, 6 and 7; fig. 5 being an end view in a line with the shaft; fig. 6 a longitudinal section, and fig. 7 a plan. Each of the propeller blades, A A A is separate, and ends in a strong spindle B, which turns in a socket in the centre boss fixed on the propeller shaft C. A cross arm D is fixed in the spindle B, to turn round the blade and hold it in any required position, this arm working in a slot in the socket, and the end of the arm is connected by a pin to the block E, which slides in an oblique groove (shown in the plan, fig. 7). This groove is formed in a ring F, which slides upon a feather, so as to revolve with the main shaft, and is moved by the bell-crank lever G, which is centered in the rudder-post of the vessel, and is worked by a screw and handle upon deck, on the top of the rod H; by moving which the pitch of the propeller blades is easily altered to any required degree, and maintained in the same position, the strain being very small, as the blades are nearly balanced like a throttle-valve, having only a slight surplus of tendency to increase the pitch, or become more in line with the shaft. The whole of the apparatus is contained within the spherical casing I I, one-third the diameter of the propeller, which effectually protects it from injury.

It will be seen that th form of this Propeller is opposed to all the received notions of a correct Screw Propeller. The first leading feature is, that instead of continuing the blades down to the shaft, and keeping the centre boss as small as possible, one-third of the entire diameter is filled up as a sphere, as shown by the dotted circle in figs. 1 and 2. In the experiments which Mr. Griffiths and the writer made, it was ascertained that the centre part of the blades of the ordinary screws, included within the dotted circle, *absorbed* 20 *per cent.* of the power, without having any propelling effect, in consequence of that part of the blades (particularly in coarse pitched screws) being nearly in a line with the shaft, the effect being when working to hurl the water off by its flapping and centrifugal action at right angles to the shaft, and seriously disturbing the more solid water upon which the more effective portion of the screw should act. The great vibration at the stern of all screw vessels arises

from this flapping action of the flatter portion of the blades in their downward course, striking the denser water below them, which, affording a greater resistance than the water above the blade in its upward course, produces this evil vibration, at an enormous sacrifice of power. The effect of this destructive action can be appreciated by the fact that screw vessels if trimmed, say 2 inches by the stern, when under canvass or at anchor, will suddenly be 2 inches down by the head the moment the engines are set to work; in point of fact, a large amount of engine power is exerted in lifting the stern of the ship out of the water, by the action of the flat part of the screw blades, as described.

The ball shown in the drawing is made to cover this destructive portion of the screw blades, or rather is substituted for the central third portion of the screw, as shown by the dotted circle in figs. 1 and 2. It will be seen that the power required to revolve this in the water, at a great velocity, is insignificant compared with driving two or three comparatively flat blades of the same diameter, which may be fairly compared to the centre of a centrifugal pump. That there can be no tendency to vibrate the stern of the vessel is obvious, nor does the trim of the vessel alter in the least degree when under the action of the new Propeller. Moreover, from the water not being violently agitated by the centrifugal action, the effective parts of the propeller's blades are screwing in stiller and more solid water, producing a better result, and with a considerably less amount of slip. The water leaves the propeller in a direct line with the vessel, and without the commotion resulting from the ordinary screw; the strength of the screw is much increased by this form, which also affords great facility for replacing the blades in case of accident, to which screw vessels in channel and river navigation are peculiarly liable.

The second important feature is the *form of the blades*, which instead of being larger at the extremities, *are precisely the reverse*. The best form the writer has found to be as shown in the engraving, fig. 5. The breadth of the blades is the full diameter of the sphere at the root, tapering to two-thirds of this size at the periphery, at which part they are about one-third only of the size of the ordinary screw blade; and with these proportions, so complete is the hold this propeller has upon the water, that it has been requisite in practice even to reduce the diameter considerably below the ordinary screw.

The water which follows the wake of the ship, and what the sailors call the "dead water," may be compared to the eddies below the piers of a bridge through which a rapid tide runs, and where, as every one knows, the water is dead or in a state of rest, the more so at the very centre of the pier. In a precisely similar condition is the dead water of a vessel, the water being most solid towards the centre, and gradually becoming less so until mixed in the current running beyond the width of the ship. It must be obvious that the nearer the work can be applied to the screw shaft, the better mechanical result will be obtained; the arrangement of the blades of the new Propeller has been so contrived that their broad part is made at the ball, so that advantage is taken of the central dead water, just described, to obtain the utmost duty from the propeller blade at its root, or as near the screw-shaft as the central ball will admit. The blades are reduced towards the periphery to meet the difference of velocity at which they travel through the water. So effective is the hold of these blades upon the water, from the causes described, that the writer has found in practice the speed of the propellers can be reduced, with the greatest advantage, one-third below the velocity found necessary for the ordinary screw; a fact which every engineer will admit to be of great value, seeing the many mechanical difficulties which present themselves in obtaining the speed hitherto considered necessary.

The screw has hitherto almost entirely been applied as auxiliary power, and where large power has been employed has never yet been made to equal the speed of the paddle-wheel. The imperfections of the screw appear hitherto to have placed a limit on the speed it was possible to obtain.

In those vessels where a large amount of engine power was applied, no adequate increase of speed was obtained; and in the case of the *Rifleman* and others, which were altered, and the engine power absolutely reduced one-half, as good a result was obtained after the alteration as with the larger power; showing that beyond a given power the water is screwed through the screw, instead of the vessel being screwed through the water. This action takes place in all screw vessels to a most serious degree, when going head to wind, or in towing, when the engines make their full number of revolutions, but have little effect in propelling the ship. The perfect hold that the new Propeller has also under such circumstances upon the water, bids fair entirely to remove these difficulties, and will tend greatly to increase the value of the screw as a propeller.

The new Propeller was applied to a tug-boat, the *Lady Emily*, 12 horse power, diameter of screw 3 feet 8 inches, on the Kennet and Avon Canal, under the direction of Captain

Morrice, R.N., the manager; and the results showed that with one barge laden with sixty tons, she went from Bath to Bristol, deducting stoppages going through locks, in 2¾ hours, the distance being eighteen miles. As other barges were added, the speed was reduced, and the engines were pulled up in exact proportion to the reduction of speed. The revolutions of the propeller, without any barge in tow, were 210 per minute; with a sixty-tons loaded barge, they were reduced to 180; with two barges, to 160 revolutions per minute.

The question of the pitch of the screw appears hitherto to have baffled all those who have experimented upon it; the ordinary theory being that an increasing of the screw's pitch should either pull up the engines or increase the speed of the vessel in proportion to such increase of pitch; but all the practice hitherto has proved this not to be the case, and, consequently, the screws have been made without any power of altering the pitch to meet the variations of winds and currents to which all sea-going vessels are subject; and they have been thus deprived of what would appear to be the most valuable feature of the screw, viz., its power of adapting its pitch to meet every contingency. It has been found by the experiments that, with the new Propeller, the engineer can control the speed of his engines at pleasure, by increasing or diminishing the pitch of the blades, so that in a fair wind the full power of the engines may be exerted in effectually propelling the vessel, instead of consuming fuel in driving round the engines (with a fine pitched screw) to no purpose; and again, in going head to wind, by diminishing the pitch the engines can be made to give out their utmost duty with a certainty of effectually propelling the vessel. The large central ball affords the opportunity of constructing a most simple and effective arrangement for altering the pitch of the blades, and feathering them parallel to the shaft when not required for propelling. The captain or engineer of the vessel can alter the pitch at pleasure without even stopping the engines; the speed of which is, by means of this apparatus, as completely under control as with a throttle valve.

A most serious disadvantage hitherto of the screw as a propeller, compared to the paddle-wheel, has been the great difficulty of going astern, and many serious accidents have happened to screw vessels in crowded navigations, from its being out of the power of the captains, when in difficulty, to go quickly astern; so soon as sternway is obtained, screw vessels will not steer, and become unmanageable. During the experiments in the *Ranger* with the new Propeller, the vessel was frequently stopped when at full speed, the engines reversed, and the ship brought quickly astern, nearly as quick as a paddle vessel, and a run was made above a mile astern, full speed, between Woolwich and Erith, steering among the various craft as easily as when going ahead. This fact gives further convincing proof of the complete power which this propeller gives the captain over his vessel. This power of going astern will be of enormous value to vessels of war in manœuvring in an engagement, which they do not now possess.

It will be clear by the accompanying Table of trials made upon the *Eagle*, that as the pitch was increased, so was the engine brought up in her speed. The comparative slip between the new screw and the old one at same pitch, 7 feet 6 inches, is 272 yards per mile, or 13 per cent. with the former, against 665 yards, or 27 per cent., with the latter; the gain with the same pitch being an increased speed of ¼-mile per hour, with 27 revolutions per minute less of the engines; making 16 per cent. less consumption of power and coals. At the 9 ft. 6 in. pitch the increased speed is five-eighths of a mile per hour, with 35 revolutions per minute less of engine; making a saving of 22 per cent. The Table also contains trials of the *Ranger*, 300 tons, in London, and the *Weaver*, at Liverpool, the whole of the experiments illustrating the foregoing arguments. A sheer plan of the *Weaver* is given in fig. 4.

Fig. 4.

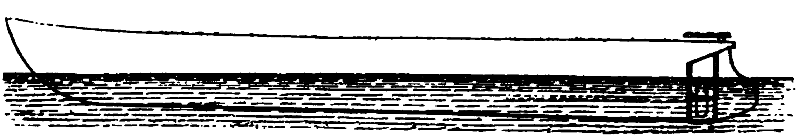


Table of Comparative Trials of Griffiths's Screw Propeller.

Trials of the	Description of Screw.	No. of Trial.	Screw Propeller. Diameter.	Screw Propeller. Pitch.	Screw Propeller. Extreme Angle.	Screw Propeller. Revolutions per minute.	Engine. Revolutions per min.	Engine. Steam Pressure per in.	Engine. Vacuum Pressure per inch.	Time of Running the Measured Nautical Mile.	Speed Statute Miles per hour. Boat.	Speed Statute Miles per hour. Screw.	Slip of Screw.	Gain or Saving in Power.	Gain or Saving in Speed.
			ft. in.	ft. in.	Degrees.	No.	No.	lbs.	lbs.	min. sec.	Miles.	Miles.	per cent.	per cent.	per cent.
"Eagle," at Bristol.	Old	1	4 10	7 6	26½	200	200	38	—	5 34	12·36	17·00	27½	—	—
	New	2	4 10	6 6	23½	195	195	35	—	4 59	13·80	14·40	4	12½	11¾
	"	3	4 10	7 6	26½	173	173	37	—	5 23	12·79	14·74	13¼	16¼	3½
	"	4	4 10	8 6	29½	171	171	34	—	5 25	12·70	16·51	23	16¾	2¾
	"	5	4 10	9 6	32¼	165	165	35	—	5 15	13·12	17·80	26¼	22¾	6
"Ranger," at Liverpool.	Old	6	7 0	6 10	17¾	159	60	12	13½	7 3	9·76	12·33	20¾	—	—
	New	7	5 10	10 0	28½	116	44	10	12¼	6 36	10·45	13·23	21	36	6¾
	"	8	6 2	6 8	19	143	54	12	12	5 8	13·45	—	—	—	—
	"	9	6 2	6 8	19	132	50	—	—	11 14	6·14	—	—	—	—
	"	10	6 2	6 8	19	137	52	12	12	8 11	9·80	10·42	6	—	—
"Weaver," at Long Reach.	Old	11	3 3	4 6	24	332	83	11	14	6 2	11·40	16·97	32	—	—
	New	12	3 3	4 6	24	260	65	11	14	5 37	12·38	13·29	8	27	7½

EXPLANATION OF TABLE.

Trials of the "Eagle," at Bristol, June, 1851.

Single high-pressure engine, cylinder 26 inches diameter, 18 inches stroke, screw worked by direct action. Vessel and Engine by Lunell and Co., Bristol.

No. 1. Trial.—Average of several pairs of runs with common Propeller.

Nos. 2 to 5.—Average of four pairs of runs with new Propeller.

Note.—The new Propeller was made 4 feet 2 inches in diameter, but the opening in the vessel having been increased during construction to 5 feet, the Propeller was enlarged in diameter, by welding pieces on the points of the blades, which were thereby thrown out of their proportionate size.

Trials of the "Ranger," at Long Reach, December, 1851.

Pair of condensing engines, cylinders 27 inches diameter, 24 inches stroke, screw worked by gear of 106 to 40. Vessel and Engines by Miller and Ravenhill.

No. 6 Trial.—Single run with common Propeller, with a 40 minutes ebb-tide, and wind in favour.

No. 7.—Single run at top of tide, with new Propeller at the coarsest pitch.

Note.—The *Ranger* being employed on a station from which it was impossible to spare her for the purposes of experiment, there was no opportunity of making a proper set of trials to compare her ordinary screw with the new Propeller; but her speed was taken at the measured mile, when going with a cargo, with a 40 minutes ebb-tide and wind in her favour, as given in No. 6 Trial.

No. 8.—Run down with tide, with the new Propeller.

No. 9.—Run up against tide, with the new Propeller, showing a reduction of 4 revolutions per minute of the engine, with same pitch of screw.

No. 10.—Average of Nos. 8 and 9 trials.

Note.—The pitch of the new Propeller was subsequently reduced to 5 feet 2 inch when running against tide, which allowed the engines to get up to 70 revolutions per minute, by which a speed of 7·95 statute miles per hour against the tide was obtained; and this added to the run down with tide No. 8, at 6 feet 8 inch pitch, gives an average speed of 10·69 miles per hour.

Trials of the "Weaver," at Liverpool, June, 1852.

Pair of condensing engines, cylinders 22 inches diameter, 15 inches stroke, screw worked by gear of 4 to 1. Vessel by John Laird, Birkenhead, engines by Fawcett, Preston, and Co.

No. 11 Trial.—Average of a pair of runs with common Propeller, from Woodside-pier to Eastham-pier, 5¾ statute miles.

No. 12.—Average of a pair of runs, between the same places; with same state of tide as No. 11 Trial, in the preceding week, but wind strong and unfavourable, and a heavy sea.

A model, illustrating the principle of the new Propeller, was exhibited by the Secretary. The model showed an ordinary screw propeller, which was divided into three portions, so that one-third of the propeller in the centre could be removed, and a ball of the same diameter substituted, upon which the two blades forming the remainder of the propeller were then fixed, in the same relative position as in the original propeller.

Mr. Preston said he had witnessed the experiments made on the *Weaver*, that were described in the Paper, and could confirm the statement made as to the superiority of the new Propeller in the diminution of slip, and the increase of speed of the vessel. He did not perceive any superiority in the amount of back-water produced; in going ahead the vessel dipped astern with both propellers, and he did not perceive any difference; but it was a very flat vessel, and the bows rose so abruptly that the head was forced up by the action of the water. The experiments were tried in the Mersey, above Liverpool, and the effect of tide was deducted by trying the experiment both ways. He doubted the practicability of keeping the apparatus for altering the pitch in working order, at sea, for any length of time.

Mr. Ramsbottom remarked, that if the pitch of the blades in an ordinary screw-propeller were the same throughout down the centre boss, every part of the blade would have the same advancing motion in the water, and would screw correctly through it; and he could not understand how the centre portion of the blades could have the injurious flapping and centrifugal action mentioned in the Paper, when the screw was advancing through the water, as such action could only take place if the arms were to revolve whilst the vessel was stationary.

Mr. Appold observed, that the ball would deflect the water, and throw a body of water on to the blades, giving them more water to act upon, and preventing the water from slipping away from the pressure of the blades, through the centre of the propeller, as in the ordinary form with open centre. Supposing the propeller were working through a tube of

the same diameter as the circumference of the arms, the centre ball would occupy one-third of the diameter of the tube, and reduce its effective diameter, causing all the water to pass through the reduced area, and so bringing more water in contact with the arms in the same distance, and affording them a more solid abutment for their action.

Mr. B. Gibbons thought it was to be inferred from that argument, that it would be advantageous to enlarge the shaft to the size of the ball, so as to fill up the displacement of the ball, and that would avoid the resistance offered by the front of the ball being dragged through the water.

Mr. Appold suggested that a conical form might be preferable for the front of the ball, to deflect the water from the centre on to the arms. He had found that best in his Centrifugal Pump, in which there was a similar action, and the water entering at the centre had to be suddenly deflected at right angles into a radial direction; he had tried a pump with the centre bell-mouthed from the inside, with the object of affording a more free entrance for the water, but he found it gave less results than the form he had adopted, having a square edge inside the opening, and the centre coned from the spindle to the centre disc.

THE EXCISEMAN'S STAFF QUESTION.

[By a strange oversight, the following letter from Mr. Smith, which should have appeared in our last Number, was omitted. As it is necessary to a proper understanding of the points in discussion between Mr. Smith and "Indagator," and as "Indagator's" last letter was intended to be a reply to Mr. Smith's communication, we now insert it with our apologies to Mr. Smith for its unintentional omission. — ED. M. M.]

Sir,—Four solutions of the problem of the Exciseman's Staff have appeared in the *Mechanics' Magazine*, and "Indagator" will pardon me if I gently hint that there is still a very desirable vacancy for a *fifth*. If this should turn out to be the case, "Indagator" himself ought to acknowledge that, with the labours of his three predecessors before him—the courses they pursued, and the rocks on which they struck, all exposed to his view—he is by no means entitled to the same amount of indulgence as those who pioneered a path for him, which ought to have presented but little obstruction.

Assuming that "Indagators's" concluding remarks apply to me, I would request his attention to p. 174, *ante*, where he must see that I have not "*adopted*" any "*error*" whatever from the "*elegant and general investigation of 'Workman' contained in No.* 1514;" nor can I discover the slightest grounds for his asserting so. "Workman" assumes a general case, and blunders in stating the most obvious conditions of his own assumption. I *copied* a portion of his paper for the purpose of pointing out an absurdity; but I deny having *adopted* any of his *errors*, or that I made them the basis of my reasoning.

Had time permitted me, it is probable that before closing my remarks, p. 174, I should have pointed out to "Workman" and his "several interested friends," the following strange anomalies with those which I then endeavoured to indicate; but I really thought it enough to draw attention to the blunder, and leave it for the penetential cogitations of the little community.

"W. cos. β = resolved force of gravity *in direction* PD."

"F. cos. β = resolved force of F *in direction* DP."

Now, it is clear from what immediately follows these extracts in "Workman's" investigation, that the words "in direction PD," &c., have been taken to mean *in the line PD*, whereas neither of the resolved forces referred to act *in* that line, but in a line (it may be lines) parallel to PD, and removed some distance from PD. Hence his equation (3) is absurd for more reasons than one:

1. There can be no *slipping* at all at P, within the limits

$$\beta=\left(\frac{\pi}{2}+\phi\right) \text{ and } \beta=\left(\frac{\pi}{2}-\phi\right)$$

as shown in my former observations.

2. His equation (3) is merely the algebraical *sum* of parallel pressures, which *do not act in the same right line*, and obviously cannot be an *equation of equilibrium*, as there are other conditions required.

It follows, then, that the tendency to *slipping*, which it was the object of this

equation to prevent, would, nevertheless occur if cos. $\beta = \sin. \phi$.

Again, from "Workman's,"

Eq. (1) we have $W = F + R$.

Eq. (3) „ $W = F.-$

Eq. (6) „ $W = F.\frac{x + z. \cot. \beta}{n + r. \cot. \beta}$.

A comparison of (1) and (3) exhibits an absurdity which we do not often witness in print, and an inspection of (6) evidences the most profound oblivion that there is such a thing as fiction in existence. Yet these are the amiable gentlemen who speak so pompously on the "*discussion of philosophical truths*" (?); who puff so egregiously about "*elegant generalizations;*" and who complacently call each other "*distinguished mathematicians!*"

"*O, shades of Archedamus!*"

Having thus disposed of a few of "Workman's" errors, let us now turn to those of "Indagator" himself, one of which, I believe, appears in page 184, col. 2. "Workman," like the rest of mankind, seems quite capable of erring for himself, and I am sure "Indagator" is too generous knowingly to impute to him an *error of principle* which is evidently "Indagator's" own. This error on "Indagator's" part is very remarkable; it is not a mere accidental lapse, but an inveterate violation of a simple and well-known mathematical principle in respect to the friction of a surface! To this error I would invite attention; it is to be found in the page and column above stated, and is comprehensive enough to embrace the *whole* of what "Indagator" has there said about "*vertical pressure,*" "*normal pressure,*" and the "*ratio*" of friction to the insistent pressure.

I have now to request attention to page 185, col. 2, where, I apprehend, "Indagator" is again at fault in his equations of equilibrium:

$$-R. \sin. \alpha + (W - \mu V) \sin. \beta = 0 \ldots\ldots (1)$$

$$R \cos. \alpha - (W - \mu V) \cos. \beta = 0 \ldots\ldots (2)$$

Assuming $(W - \mu V) = Q$, and substituting in (2) we find

$R. \cos. \alpha = Q. \cos. \beta$; but $\alpha = \beta$,

$$\therefore R = Q \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Now because *two* pressures cannot be in equilibrium unless they act in the same right line (which these do not), as well as in opposite directions, equation (3) indicates a state of *motion*, and not one of *rest*. Hence equation (2) is the expression of a *rotation* in the body about the point A, and is entirely inconsistent with the imposed conditions in equation (1), and they cannot therefore obtain together by any necessity which has been shown.

We now pass on to "Indagator's" equation of moments (2), and here I think he is again in error. While much has been said in this discussion respecting the friction of *slipping*, it would appear that special care has been taken to keep out of view the equally obvious fact, that in forming this equation of moments, the friction at A must be taken into account, and will enter that equation in the form of a moment in every position of the body from the horizontal to the angle of friction. It is little matter whether we call this friction the "friction of rolling" or the "friction of an axle;" it exists: and whatever may be the angle of inclination of the staff, the equation of moments is *incorrect* unless it take cognizance of this friction at A; but if this moment of friction enter at all—and who will deny that it ought—it must enter under the ambiguous sign $\pm$, indicating a *superior* and *inferior* state bordering upon motion, all that has been said to the contrary notwithstanding.

The supplementary lecture of "Indagator" must be accepted and considered as emanating from a very profound knowledge of the laws of friction and resistance of bodies in contact. Who but himself could have so clearly unfolded the occult properties of "*that part of the pressure which is independent of the friction on the body;*" and who but he could have so philosophized upon the antiquated fable of "*no friction.*" Then, again, as to what queer things have been "*found by experiment;*" how the "*equation of moments provides against the motion of rolling,*" and, of course, annihilates the resistance opposed to rotation at his point of contact A. This, and all that follows upon the same

subject, must be deemed and taken as highly edifying indeed. I must, however, dissent from his violent term "*villanous*," which I think quite unjustifiable under the circumstances.

I am, Sir, yours, &c.,
T. S.

Sept. 10, 1852.

ON THE PREPARATION OF ARTIFICIAL EXTRACTS OF FRUIT. BY PROFESSOR FEHLING.

(Translated for the *Mechanics' Magazine*, from the *Wurtemburg Journal of Industry*.)

Amongst the chemical preparations exposed at the London Exhibition, the artificial extracts of fruits were particularly deserving of attention. Although some of these extracts, as, for instance, butyric ether, have already found applications, their use has been hitherto only on a very limited scale. It is now, however, no longer to be doubted but that the majority of our artificial organic compositions will, ere long, be extensively applied, and their practical applications cannot but have a very stimulating effect on the study of organic chemistry, which will again most probably lead to the discovery of technical applications for the new organic compositions which the investigations of our modern chemists have furnished us with. Among the extracts of fruit exhibited by a London manufacturer, those which more particularly attracted attention were pine-apple oil, bergamot-pear oil, apple oil, grape oil, cognac oil, &c. Several of these oils have been analyzed by M. Faisst, of Stuttgardt, and the results of his researches correspond in general pretty accurately with those already published by Hoffmann, in Liebig's "Annals of Chemistry," of January, 1852. We give here a succinct description of some of these extracts, and of their manufacture.

Pine-apple Oil.

This product consists of a solution of 1 part of butyric acid ether in 8 to 10 parts of spirits of wine. For preparing butyric acid ether, pure butyric acid is required, and this is obtained most readily and in the greatest purity by the fermentation of sugar or of St. John's bread (*siliqua dulcis*). For preparing butyric acid from sugar, M. Bentch takes a solution of 6 lbs. of sugar and half an ounce of tartaric acid in 26 lbs. of water, which is left to stand for some days; at the same time about a quarter of a pound of old decayed cheese is diffused in 8 lbs. of sour milk, from which the cream has been removed; and after this has also stood for some days, it is mixed with the first solution, and the whole is kept from four to six weeks at a temperature of about 24° to 28° Reaumur, water being added from time to time to replace that which is lost by evaporation. After the evolution of gas has entirely ceased, the liquid is dissolved with its own bulk of water, and finally 8 lbs. of crystallized soda, dissolved in 12 lbs. to 16 lbs. of water, are added to it. The liquid is then filtered and evaporated till it weighs only 10 lbs., when a quantity of 5½ lbs. of sulphuric acid (*nordhausen*, or fuming sulphuric acid), diluted with 5½ lbs. of water, is carefully mixed with it by small portions at a time. The butyric acid, in the state of an oily substance, will now appear on the surface of the liquid, from which it may be skimmed off; but as the remaining liquid still contains some butyric acid, it is submitted to distillation, by which means another portion of diluted butyric acid is obtained, which may be concentrated by means of melted chloride of calcium, or by saturating it with carbonate of soda, evaporating and decomposing by sulphuric acid. By this method 1¾ lbs. of pure butyric acid are obtained from 6 lbs. of sugar.

M. Marsson says that the same product may be obtained from St. John's bread (*siliqua dulcis*) by taking 4 lbs. of mashed St. John's bread, and mixing it with 10 lbs. of water and 1 lb. of chalk; the liquid matter must be maintained from three to four weeks at a temperature of from 25° to 35° Reaumur, and be often and well stirred, and from time to time the water that has evaporated must be replaced. After all fermentation has ceased, a quantity of water equal to the bulk of the liquid is added to it, and afterwards a concentrated solution of 2¼ lbs. to 2¾ lbs. of carbonate of soda, when it is finally evaporated. To the concentrated liquid is then added 1½ lbs. to 2 lbs. of sulphuric acid, diluted with 2 lbs. of water; and the remainder of the process is performed in the same manner as already described. By this method a little more than half a pound of coloured butyric acid will be obtained. The acid, however, retains a peculiar smell from the St. John's bread, which continues even in the ether prepared from the same, whereas that prepared from sugar gives an ether of a very pure smell. It will be found advantageous to agitate the oily butyric acid with chloride of calcium, in order to deprive it entirely of its moisture.

For preparing butyric acid ether (butyrate of oxide of ethyle) from butyric acid, 1 lb. of butyric acid is dissolved in 1 lb. of rectified alcohol (95° Tralles), and is mixed with one-half to one-fourth of an ounce of concentrated sulphuric acid; the compound is

heated for some minutes, when the butyric acid ether will form a thin layer on the top. The whole is then mixed with half of its bulk of water, and the upper layer taken off; the remaining liquid being submitted to distillation, yields another quantity of butyric acid ether, which is mixed with that obtained in the first instance. and the whole well agitated with a very diluted solution of soda, in order to deprive it of all the acid; which operation should be repeated several times if a very pure ether is desired to be obtained. Care should be taken to use but small quantities of the diluted soda solution at a time, so as not to lose too much ether, this latter being in some measure soluble in water. When large quantities are to be acted upon, the washing water (*eau de lavage*) is collected, mixed with an equal volume of spirits of wine, and distilled, by which means a solution of pure butyric acid ether in spirits of wine is obtained.

Butyric acid ether may be also obtained immediately from butyrate of soda by dissolving 1 part of this salt in 1 part of rectified alcohol, adding 1 part of sulphuric acid, and heating some minutes. The ether collects on the top of the liquid, and is purified by washing with water and with diluted soda solution.

For preparing pine-apple oil, 1 lb. of butyric acid ether is dissolved in 8 lbs. to 10 lbs. of spirits of wine, which should have been previously deprived of its empyreumatic or fusel oil. Pure French spirits of wine will be found best suited for this purpose. According to the purpose for which the pine-apple oil is to be applied, either rectified alcohol of 80° to 90° Tralles, or brandy of 46° to 50° should be used for dissolving the ether. 20 drops to 25 drops of such an extract will suffice for giving a strong pine-apple odour to 1 lb. of sugar solution, to which some acid such as tartaric or citric acid is generally added.

Bergamot Pear Oil.

What is called pear oil is an alcoholic solution of acetate of oxide of amyle, and acetate of oxide of ethyle, prepared from potato fusel oil (the hydrate of oxide of amyle). The potato fusel oil, or oil of potato spirits (in German, *fuseloel*), is the compound distilled over towards the end of the first distillation of spirits made from potatoes, and is an oily liquid of a very strong and nauseous odour. This oil in the state in which it is obtained from large potato brandy distilleries, is never pure; but it may be purified by agitating it with a diluted soda solution, when the pure fusel oil collects as an oily layer on the top of the liquid; this oily substance is then submitted to distillation, and that part which distils over at 100° to 112° Reaumer is collected and forms the pure fusel oil.

For preparing acetate of oxide of amyle from this fusel oil, 1 lb. of pure ice vinegar is mixed with an equal quantity of fusel oil, to which is added half a pound of sulphuric acid; the liquid is digested for some hours at about 100°, when the acetate of oxide of amyle separates, particularly on being mixed with a small quantity of water. The remaining liquid, when mixed with more water yields, on being submitted to distillation, a further quantity of acetate of oxide of amyle. The entire mass of acetate of oxide of amyle thus obtained is now agitated several times with water, and a little soda solution, in order to deprive it of all free acid.

The acetate of oxide of amyle may also be obtained by taking 1 part of fusel oil to 1½ part of dry acetate of soda, or 2 parts of dry acetate of potash, with 1 to 1½ parts of sulphuric acid. The liquid having been kept for some time at a gentle heat, the acetate of oxide of amyle is separated by adding water, and proceeding as above explained. 15 parts of acetate of oxide of amyle are mixed with 1½ part of vinegar ether (vinegar naphtha, acetate of oxide of ethyle) and dissolved in 100 to 120 parts of spirits of wine, as in the case of pine-apple extract: as, for instance, tartaric or citric acid should be added to the sugar solution, or making use of the pear extract, which addition makes the flavour of the bergamot pear better distinguishable, and the taste acquires at the same time more of the refreshing qualities of fruit.

Apple Oil.

What is called apple oil, is a solution of valerianate of oxide of amyle in spirits of wine, which may be obtained as a secondary product when fusel oil is distilled with chromate of potash and sulphuric acid for the preparation of valerianic acid. The light solution which collects in the tops of the distilled liquid contains boldrianate of oxide of amyle, together with other liquids such as aldekyde, which gives to the product a less agreeable taste and smell. It is therefore to be preferred for preparing pure valerianate of oxide of amyle.

For preparing valerianic acid, 1 part of fusel oil is mixed by small portions with 3 parts of sulphuric acid, and afterwards 2 parts of water are added. At the same time, a solution of 2½ parts of bichromate of potash in 4½ parts of water, is heated in a tubular retort; the first liquid is then permitted to flow very slowly into the liquid of

the retort in such manner that the boiling continues, but very slowly. The liquid which is distilled over is saturated with carbonate of soda, and is evaporated either to dryness for obtaining valerianate of soda, or to the consistency of syrup, when sulphuric acid is added (say two parts of concentrated acid diluted with the same quantity of water, for every three parts of crystalline carbonates of soda). The valerianic acid forms an oily layer on the upper part of the liquid; which latter will still yield some valerianic acid on being submitted to distillation.

For preparing valerianate of oxide of amyle, 1 part, by weight, of pure fusel oil (hydrate of oxide of amyle) is mixed carefully with an equal quantity by weight of common English sulphuric acid; the resulting solution is added to 1¼ part of oily valerianic acid, or to 1¼ part of dry valerianate of soda, and is treated by a water bath, and then mixed with water, by which means the impure valerianate of oxide of amyle will be separated; this is washed several times with water, afterwards with a diluted solution of carbonate of soda, and finally again with water. In preparing this compound, it is essential that the mixture of sulphuric acid and fusel oil with valerianic acid should not be heated to a too high degree, or too long, as the product would thereby acquire an insufferably pungent smell when required for use. 1 part of valerianate of oxide of amyle is dissolved in 6 to 8 parts of spirits of wine, and acid is added in the same manner as has been before explained for the preparation of the other extracts.

GRUNDY'S IMPROVED BOAT CRANE.

(Registered under the Act for the Protection of Articles of Utility. Robert Grundy, of Rio de Janeiro, Gentleman, Proprietor.)

Fig. 1.

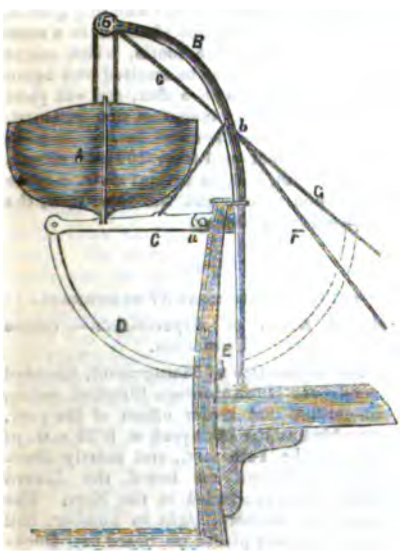
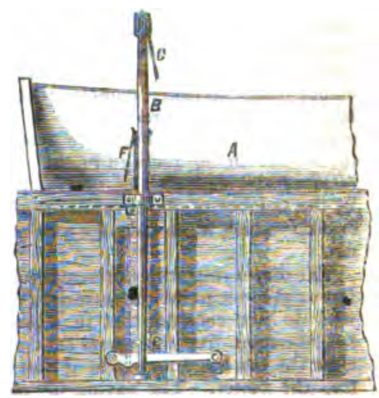


Fig. 2.



Description.

Figure 1 of the above engravings represents a cross section of so much of a ship as is necessary to show this improved boat crane, and fig. 2 is an interior side elevation of part of the bulwarks. A is the boat, which is suspended from the davits B B, in the usual manner. C is a lever jointed at *a* to the side of the vessel. At the other end of this lever there is jointed the quadrant D, the point of which passes through a hole in the side of the ship and abuts

against a lever E. F is a cord, which passes over a pulley *b* on the davit B, and is made fast to the lever C, and by which the lever and quadrant are raised and lowered. G is the usual tackling for raising and lowering the boat. When it is desired to lower the boat, the lever E is raised, which admits of the quadrant, and lever C being lowered into the position indicated by the dotted lines, which sets the boat free and allows of her being lowered into the water.

COLLIERY VENTILATION. — NASMYTH'S DIRECT ACTION STEAM SUCTION FAN.

That Nasmyth's steam suction fan, for the ventilation of coal mines (described *ante* 1507), continues to give the highest satisfaction, cannot but be generally gratifying, so often have we had to deplore the wholesale loss of life by explosions in coal mines. The many who have gone to see this fan in action are so well satisfied with its performance, as are the parties who employ it, that it may be hoped it will be extensively introduced. The object of the present communication is, however, to mention a good feature of the fan that has not before been noticed; namely, that the larger the fan, the more easy it is to make it perform its duty, the speed of the engine being reduced in the direct ratio of the diameter of the fan; that is, the number of the revolutions of the crank,—which is, in fact, the axis of the fan.

The dispensing with the usual circumferential cover to the fan surprises many who do not consider that in a *suction* fan, the more free the egress of the air, after the fan has drawn it in at the centre, the better. The saving of power from this peculiarity is very considerable.

M. S. B.

ON THE REDUCTION OF METALLIC LEAD FROM SULPHATE OF LEAD.

(Translated for the *Mechanics' Magazine*, from Liebig's "Annals of Chemistry.")

Sulphate of lead is obtained, as a residuum, in such large masses in the manufacture of acetate of alumina (from acetate of lead and alum) in calico printing, that it frequently happens that the manufacturers do not know how to turn it to account. *Payers** it should be rubbed in thoroughly with a solution of carbonate of soda, in order to obtain carbonate of lead (white lead), which is extensively used as a paint. This process, however, is only practicable when the sulphate of lead is of a very pure quality, which is not generally the case, particularly when the brown acetate of lead is used, as that substance contains a great quantity of colouring and resinous matters, which naturally does not allow of the white lead obtained being of a pure white colour. Berthier proposed long since to reduce the sulphate of lead with charcoal, in a crucible. This process is not very successful, as metasulphuret of lead is generally formed; but if this reduction of sulphate of lead by charcoal be effected in a common cupola, and even without any addition of lime, it will be found to offer no greater difficulty than the obtaining of the lead from galena. The sulphate of lead should be placed in an ordinary cupola, and heated together with fine pieces of charcoal (the refuse of wood ashes). When the entire mass is red-hot, it should be stirred or mixed up with iron bars, and heated in the same manner as in the process of roasting and smelting galena, whereby the lead will be obtained in a state of great purity. The scoria, which might still contain lead, may be smelted over again in a slag furnace with a flux, and will yield lead of less purity than that first obtained. By this process about 60 lbs. of metallic lead may be obtained from 100 cwt. of sulphate of lead, and, as several cwts. may be acted upon at one and the same time, the expense is very trifling.

TRIALS OF ANCHORS AT SHEERNESS.

Fourth Series of Experiments.—Steam Trial Plan.

The Committee of Management, presided over by the Hon. Montagu Stopford, acting commodore and senior officer of the port, assembled at the Dockyard at 8·30 A.M. of Tuesday the 14th inst., and shortly afterwards embarked on board the *Lizard* steamer, and proceeded to the Nore. The competing anchors, eight in number, had been previously placed on board two Dockyard lighters especially selected for the occasion, and towed by the *African* and *Adder* steamers to the scene of operations. Here the lighters, with standing gear attached to each, were moored in an average depth of

* Probably "proposes" is omitted.

water a quarter less 13 fathoms, the *African* and *Adder* being berthed outside of them. To the outside catheads of the steamers the opposing anchors were affixed, with stoppers ready to be cut at a given signal, the ends of a chain cable 37½ fathoms in length, previously rove through an iron-bound single sheave-block, being attached to the anchors. The steamers, of the joint power of 229 horses, were lashed to the lighters, one on each side thereof, and on the anchors being let go (a sufficient time being allowed for their reaching the ground) were propelled astern at full speed, the power being kept on the pendant of 23 fathoms attached, for the purpose of testing the holding properties of the anchors at long scope of cable.

The necessary preliminaries having been gone through, the anchors, in accordance with the drawing for stations, were assigned the following positions:

Port.

1. Rodgers' (Exhibition Prize).
2. Honiball's (Porter's).
3. Trotman's (Improved Porter's).
4. Isaacs' (American).

Starboard.

1. Aylen's.
2. G. W. Lenox's.
3. Admiralty (new).
4. Mitcheson and Son's.

Everything being ready, the trials commenced, and were proceeded with in the order here given, Lieutenant Rodgers' Exhibition Prize Anchor being opposed to Mr. Aylen's. On steam power being applied, Aylen's was run up to the block, when it was discovered not to have taken the ground, owing, it was supposed, to the strain being applied too quickly after its being let go; hence the Committee decided this should be considered as no trial. It turned out that the men employed on board the lighter had omitted to cut the stopper of Aylen's anchor until after Rodgers' had been let go, the strain of the latter in full run bringing Aylen's to the block.

Mr. Honiball's (Porter's) was next put in competition with Mr. G. W. Lenox's. This trial occupied two hours and three minutes, and was a severe one. Lenox's was drawn one link and a half of chain in 20 minutes. At length, after a protracted struggle, Honiball's was brought up to the block, but not until a large warp had been broken, and the mooring lighter, from the heavy strain caused by the steamers backing at full speed, with a tide in their favour, of 2½ knots per hour, was pinned down four feet by the head. With this terminated the first day's trials of the present series, the various persons engaged in it returning to Sheerness in the *Adder* and *Lizard*, the *African*, with the lighters, remaining at the Nore.

Second Day's Trials.—Sept. 15.

The parties interested embarked in the steamers appropriated to their use at 9 A.M. On arriving at the Nore, the experiments were resumed. Mr. Trotman's improved Porter's anchor being pitted against the Admiralty anchor, constructed on the plan of Sir W. Parker, which resulted in the latter being brought home to the block at the first trial, at long scope of cable. Mr. Isaac's American anchor was then tested with Messrs. Mitcheson and Son's; the former's inferior holding power was evinced by its being drawn up to the block at the long scope on the first trial. Further operations were now suspended, it being necessary to allow time for the placing of the winning anchors in new positions for testing. This was effected during the ensuing day under the superintendence of Mr. J. Aylen, the Master-Attendant, whose exertions and perseverance throughout the whole of the experiments have been most praiseworthy.

Third Day's Trial.—Sept. 17.

The operations commenced this morning at the usual hour with a further trial between Mr. Aylen's and Lieutenant Rodgers' Exhibition prize anchors. In this case full steam power was employed with 18¾ fathoms' bite of chain through the block on each anchor, cast in 11 fathoms water, with a tide in favour of 2½ knots, the steamers backing at the rate of 3½ knots—the competing anchors held firmly. On sighting the block Aylen's was found to have gained an advantage of one fathom over its rival. The Committee then proposed that the steamers should go ahead for a short distance, and afterwards astern at full speed. During the trial, Commodore Stopford superintended the steering of the steamers, in order to prevent any undue advantage being given to either anchor by steerage way. The heavy strain brought upon the gear caused the lighter to be pinned down upwards of three feet. Shortly afterwards, the steamers working together up to 220 horse power, Rodgers' anchor came home, Aylen's not having started from its original position at long scope of cable. At long scope, the advantage of Aylen's anchor over its competitor

was so trifling that both were considered equal in holding power, and it was not until after a most severe struggle at short stay peak that Rodgers' anchor gave way.

The two rival anchors of Trotman and Mitcheson had now to be tested against each other. Two trials were afforded them at long scope of cable, the full power of the steamers being put on without the one showing superior holding power to the other. On the first trial at short stay peak both held on. At the second, however, Mitcheson's was brought up to the block minus one-half of the stock, which, being constructed of two separate parts, shipped into the shank in dovetail grooves; the breaking of the stock is supposed to have been caused by the anchor embedding itself into the ground. In consequence of this circumstance the Committee decided that Mr. Mitcheson's anchor should be further tried with its competitor, should Mr. Mitcheson choose to replace that portion of the stock which was carried away. Further operations were then suspended until the following morning. Scarcely, however, had the Committee arrived at the Nore, when it was deemed advisable, owing to the threatening appearance of the weather, to return to port, and to defer the continuation of the experiments until Monday, the 20th inst.

Fourth Day's Trial.—Sept. 24.

At 9·39 A.M. the *African* and *Adder* steamers proceeded to the Nore with the lighter in tow, on board which the anchors and gear had been placed. The *Lizard* steamer, with the Committee of management, followed shortly afterwards, to superintend the further experiments. Lieutenant Rodgers' Exhibition Prize Anchor had, during the present series, been twice placed in competition with Mr. Aylen's anchor, proving victorious in one instance, and being beaten in the other. In order, therefore, to determine which possessed the greater holding properties, a third trial took place between them, which resulted greatly in favour of Lieutenant Rodgers'.

Mr. G. W. Lenox's anchor having now become next best to Lieutenant Rodgers', it became necessary to oppose these to each other. Both having let go at the same time, the steam power was applied, when Lenox's brought his rival up to the block. The steamers *Lizard* and *Adder* then returned into port, the *African* remaining at the Nore in charge of the lighter.

Fifth Day's Trial, Sept. 25.

The experiments were resumed this day at 10 A.M., and commenced with a further trial of Mitcheson's and Trotman's anchors, which resulted in Trotman's being speedily brought home. On reference to the results of the 17th inst., it will be seen that Mr Trotman's anchor, after a severe contest of hours' duration, brought Mr. Mitcheson's home with a broken stock. This having been repaired at the Dockyard, the two rivals were again placed in competition. A struggle was expected, but from some cause—possibly the mere accident of the one anchor falling on its stock end, and the other on its face, in which position the momentum imparted by the two steam tugs, backed at full speed, is suddenly brought to bear upon them, whereby no chance is given for the canting of the one anchor, the few fathoms of chain flew through the block, and in a very short space of time all contest was at an end. The result thus far is in favour of Mitcheson's—in the former instance to Trotman's; which makes it, so far as the trials at the Nore are concerned, a drawn affair.

Mr. Mitcheson's anchor was then pitted against Mr. Lenox's, the latter holding equally with its competitor. At short-stay peak, however, Lenox's yielded to its rival, —in fact, broke ground first.

In accordance with the suggestions of the Committee of Naval-officers and Shipowners, the four trial plans have thus been fully carried out, whereby the holding properties, quickness in taking the ground, tripping, &c., of the competing anchors, have been subjected to every available test that the means at disposal would admit. The results cannot fail to afford many valuable hints for the further improvement of this instrument, which ought to be the most perfect within the powers of human invention, more especially with reference to its peculiar and important uses, as on the anchor mainly depends the safety of our ships and their crews when riding in furious gales.

A most important property appertaining to the rival anchors—that of strength—has yet to be ascertained. For this purpose they are to be taken to Woolwich, there to be subjected to hydraulic pressure until broken. The labours of the Committee will then terminate, with the exception of drawing up their report.

The following statistical account of the result of the various experiments will afford our readers a correct idea of the holding qualities of the several competing anchors:

First Series of Experiments. At the Dockyard.

Trotman beat.	Honiball beat.	Mitcheson beat.	Rodgers beat.	Aylen beat.	Admiralty (new) beat.
Rodgers' Ex. Prize Admiralty (new) Honiball (Porter's) Rodgers' stream kedge Admiralty (new) 6 cwt. heavier.	Aylen. Mitcheson	Isaacs' (American) Admiralty (new) Rodgers' stream kedge G. W. Lenox Aylen.	Aylen. Admiralty (new)	Admiralty (new) Isaacs.	G. W. Lenox.

Second Series of Experiments. On the Beach, at Garrison Point.

Trotman beat.	Honiball beat	Mitcheson beat.	Rodgers beat.	Aylen beat	G. W. Lenox beat.
Aylen. G. W. Lenox. Honiball Admiralty (new).	Isaacs' (American) Mitcheson.	Rodgers' (E. P.)	Aylen's (2nd trial).	Rodgers' (1st trial).	Admiralty (new.)

Third Series of Experiments. At Black Stakes, in the Medway.

Trotman beat.	Rodgers beat.	Mitcheson beat.	Aylen beat.	G. W. Lenox beat.
Aylen. G. W. Lenox.	Admiralty (new).	Rodgers' (E. P.) Honiball. Mitcheson.	G. W. Lenox.	Isaacs.

Fourth Series of Experiments. Steam Trials at the Nore.

Trotman beat.	Mitcheson beat.	Aylen beat.	Rodgers beat.
Admiralty (new). Mitcheson (1st trial).	Honiball. Isaacs (American) Trotman (2d trial.) Lenox.	Rodgers (at 2nd trial)	Aylon (1st and 2d trials).

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING SEPTEMBER 29, 1852.

JOHN MERCER, of Oakenshaw, Clayton-le-Moors, chemist, and JOHN GREENWOOD, of Irwell Springs, Bacup, Turkey-red dyer. *For certain improvements in preparing cotton and other fabrics for dyeing and printing.* Patent dated March 15, 1852.

These improvements have relation to what is known as the "oiling process" in dyeing Turkey-red, and consist in causing the cloth or fabric to be wetted with water, or a watery solution, when passed through or impregnated with oil.

The patentees prefer the use of the ordinary padding-machine for wetting the cloth or fabric; and they use either water or a watery solution containing 4 ozs. to 5 ozs. of the carbonate of soda or potash to the gallon. The oil is contained in a vat or vessel provided with a series of rollers and a pair of padding bowls at one end. The cloth is passed under and over the rollers and between the bowls, which are immersed in the oil in the vat. The patentees prefer to use the oil at a temperature below the boiling point, but it may be also employed at a greater heat. The cloth, after having been impregnated with oil, is stoved at 180° Fahr., and is then passed through alternate operations of washing in carbonated alkaline solution and stoving, after which the dyeing is proceeded with as customary. The oil employed is olive oil, and it is recommended that it should have from 8 ozs. to 10 ozs. of carbonated alkali dissolved in it previous to use.

Claim.—The causing the cloth or fabric to be wet with water, or a watery solution, when passed through or impregnated with oil.

FRANCIS WHEATLEY, of Greenwich, Kent, gentleman. *For an improved safety cab-omnibus.* Patent dated March 18, 1852.

Mr. Wheatley's improved omnibus is intended to carry eighteen passengers—ten inside and eight outside. The inside seats are so arranged across the omnibus that each passenger has a separate compartment, which is divided from the adjoining ones by a partition of some elastic material, a space being left from end to end at the centre of the vehicle, along which the passengers pass to their seats. This central space is covered with a semicircular glass roof, for the purpose of admitting light, and the roof is raised sufficiently to allow of the passengers standing upright without inconvenience. Provision is made for ventilation in each compartment, and the door of the vehicle has perforated metal plates inserted in it for the same purpose. Access is obtained to the roof by spring steps.

Claim.—The mode of constructing the seat so that each passenger sits facing the horses, and has a separate compartment; the semicircular glass roof; and the application of perforated metallic plates in making the doors, for the purposes of ventilation.

WILLIAM WESTLEY RICHARDS, of Birmingham, gun-manufacturer. *For certain improvements in fire-arms, and in the means used for discharging the same; also improvements in projectiles.* Patent dated March 20, 1852.

The improvements claimed under this patent are—

1. A mode of constructing revolving pistols, in which the hammer has a horizontal motion.

2. A mode of constructing revolving pistols, in which all the motions in the lock are obtained from a single spring.

3. A mode of connecting the single barrel of revolving pistols with the body and revolving barrel, and the application of the same to rifles and guns.

4. The construction of the muzzles of rifles wholly or partially of steel.

5. A peculiar construction of swivel for the locks of firearms.

6. The application of tubes of gutta percha to percussion caps, and a peculiar construction of primer for firearms.

7. The employment of gutta percha, horn, wood, or other suitable non-metallic body in forming the cores for hollow rifle balls, and the introduction of rings or tubes of tin-plate or other hard metal into the hollows of such balls.

8. The application of gutta percha mixed with shavings or raspings of cork in the manufacture of gun waddings.

JOHN M'DOWALL, of Walkinshaw Foundry, Johnstone, North Britain, engineer. *For improvements in cutting wood and other substances, and in the machinery or apparatus employed therein, and in the application of power to the same parts of which improvements are applicable for the transmission of power generally.* Patent dated March 20, 1852.

Mr. M'Dowall's improvements are intended to obviate the necessity of employing the ordinary heavy frames and buckles for giving tension to the saws, at the same time that an increased working velocity is attained, and the required rake or overhanging given to the saws according to the rate of feeding in of the material.

The claims embrace the various modes of operation and the machinery described and shown in the drawings.

William Symington, of Trafalgar-place West, Hackney-road, gentleman, Charles Finlayson, of Manchester, engineer, and John Reid, of the same place, gentleman. *For improvements in flues, and in heating air, and in evaporating certain fluids by heated air.* Patent dated March 22, 1852.

1. The "improvements in flues" consist in constructing the same of a combination of external metal flues with linings of clay, or earthenware pipes in short lengths, any of which may be readily removed when injured, and replaced by others.

2. The "improvements in heating air" consists of an arrangement of flues of the above mentioned construction with a suitable furnace.

3. The "improvements in evaporating certain fluids by heated air" have relation to sugar evaporating pans, wherein a series of revolving discs are employed to raise the liquid in thin films, in order the better to expose it to the action of the heated air, and consist in the employment of the same furnace to heat the air used in the process, and the bottoms of the pans, the latter object being effected by means of flues surrounding the same, through which the products of combustion are caused to circulate.

4. The patentees propose to introduce into the flues of Cornish boilers short lengths of clay or earthenware pipes of different diameter, the large and small pipes being placed alternately, which arrangement they have found to be most advantageous.

Claims.—1. The improvements described in combining the use of external flues of metal with internal linings of short clay or earthenware pipes.

2. The improvements described in heating air, and evaporating certain fluids by heated air.

John Drumgoole Brady, of Cambridge-terrace, Hyde-park, esquire. *For improvements in helmets, cartridge-boxes, and other military accoutrements.* Patent dated March 22, 1852.

1. The improvements in helmets and other head-pieces consist *first* in an improved form and combination of materials for a military helmet; and, *second*, in certain arrangements for the ventilation of helmets, and other head-pieces generally.

2. The improvements in cartridge-boxes and other military accoutrements, such as sword scabbards, bayonet sheaths, &c. consist in constructing them of a foundation of gutta percha, or gutta percha composition, covered, or partially covered with felt or leather, whereby they will be extremely light, and when unfit for service, the material (gutta percha) can be again rendered available.

3. The improvements in other military accoutrements consist also in an improved arrangement of belts and means of slinging cartridge-boxes.

Figs. 1 and 2 of the engravings are front and side elevations of the improved helmet,

Fig. 1.

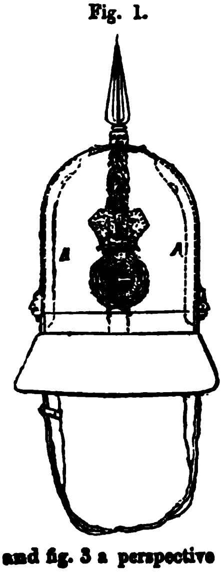


Fig. 2.

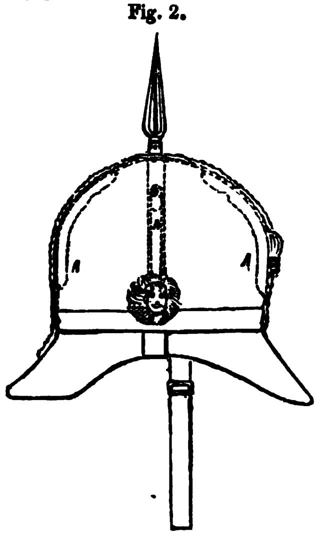
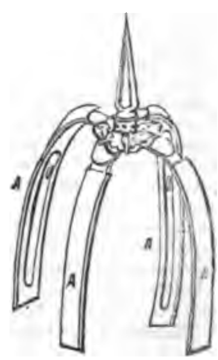


Fig. 3.



and fig. 3 a perspective view of the frame or foundation. A A are four thin hollow strips

of metal, which may unite at the crown, or merely be carried some short distance up and left open at top; at the base, and immediately above the head, these tubes are perforated for the admission of air, to give ventilation to the head. The frame is then covered with felt stiffened and formed into the shape shown in the engraving, with openings corresponding with the lower openings of the tubes. The helmet is open at top for the escape of the heated air, and is furnished with some ornamental device according to the regiment for whose use it is intended.

For the ventilation of helmets and other head-pieces generally, the patentee places on the inside of such head-piece two or more thin hollow strips of metal or gutta percha, and admits the air by leaving them open at bottom, at the sides of and flush with the body of the helmet or other head-piece. At top, these hollow strips are perforated or are left open just above the head. An opening or openings must be made in the top of the head-piece, for the escape of the heated air.

Instead of hollow strips or tubes, pieces or strips of metal or gutta percha, with edges bent round so as to form a tube with the side of the helmet or other head-piece, may be used.

The improved cartridge-boxes are formed by moulding gutta percha or gutta percha composition into the required shape, and attaching the felt or leather covering by heating the surface of the gutta percha sufficiently to cause adhesion. Swords-scabbards and bayonet-sheaths are also made of a foundation of gutta percha, wholly or partially covered with felt or leather, and united by heating the surface of the gutta percha.

It is proposed to provide each soldier with two cartridge-boxes, one to be carried in front, and the other behind; and for this purpose the patentee constructs an improved military accoutrement of a leather waist-belt and a shoulder-strap fastened to each cartridge-box; it is provided with a buckle in front, to enable the soldier to lessen or increase the weight on the waist-belt to suit his convenience. The two cartridge-boxes are attached by studs to the waist-belt, or they may be connected to it by hooks. As soon as the soldier has fired away the rounds of cartridges in the front box, which is placed conveniently to his hand, he changes place with the boxes, and brings the back cartridge-box round to the front.

Claims.—1. The improved helmet before represented and described.

2. The means of ventilating helmets and other head-pieces before described.

3. The formation of cartridge-boxes, sword-scabbards, and bayonet-sheaths of a combination of gutta percha and felt or leather, as before described; and

4. The improved military accoutrements before described, in so far as respects the combination of a waist-belt, shoulder-strap, and cartridge-boxes.

WILLIAM FROGGOTT, of Manchester, house and decorative painter. *For a certain improvement or certain improvements in the process of decorative painting, which improvement or improvements are applicable to rooms, halls, carriages, furniture, and other purposes to which decorative painting has or may be applied.* Patent dated March 20, 1852.

First Process.—To produce a plain white polished surface, the patentee takes carbonate of lead or zinc white, which he grinds up with turpentine, then partially dries, and mixes with copal body varnish. This compound is then laid on to the surface to be covered until the requisite number of coatings has been given, and in each successive coating the quantity of varnish should be increased. When dry the surface is rubbed smooth with pumice-dust or rotten-stone, and polished with the hand.

Second Process.—For coachmakers' work, much time will be saved by mixing the different colours required (ground up with turpentine) with the white body varnish above described, and a fewer number of coatings will be required than when the varnish is laid on over paint, as is now the case.

Third Process.—For some kinds of internal decoration, a compound that dries very quickly is produced by mixing zinc white, ground with turpentine and dried, with varnishes composed of gum and alcohol.

Fourth Process.—Any kinds of ornamental devices, such as flowers, scrolls, shields, tablets, &c., may be produced on polished surfaces obtained as above, by cutting out the ornament in paper, and pinning it on to the surface, and then stippling over the whole with any suitable paint by which a dead ground can be produced. When the stippling is dry and the paper removed, the ornament will be left in high and bright relief. Another method consists in painting the ornament with a solution of sugar, starch, gelatine, or gum, then stippling over the whole surface, and, when dry, washing with water, by which that portion of the stippling by which the ornament is covered will be removed, together with the gum, starch, or sugar used in stopping it out, and the ornament will be left in bright relief.

Claim.—The improvements in producing smooth polished surfaces, and the mode by which a dead ground is obtained, with the ornamental design in high or bright relief.

EDMUND MORewood and GEORGE ROGERS, both of Enfield, gentlemen. *For*

improvements in shaping, coating, and applying sheet metal to building purposes. Patent dated March 24, 1852.

The *first* of these improvements consists in causing sheets of iron, or other metal, intended for corrugating, to be rolled of unequal thickness in different parts. The thick parts are preferred to be brought in the corrugating process to a position at the top of the corrugations, and the increase of thickness should be gradual. Sheets of unequal substance of this kind may be usefully applied in ship-building, in panelling, and for other purposes.

The *second* improvement consists in corrugating sheets of metal diagonally, and in doing this, allowance must be made in cutting the sheets for the distortion consequent on this peculiar method of corrugating.

The *third* improvement has relation to the application of corrugated sheet metal to roofing, and consists in causing the corrugations to run diagonally, and in placing the wooden rolls, when used, in the same position. When the roof is of the ordinary kind, and without hips, a roll or gutter should be placed on each side at about the middle of its length. When a gutter is thus used, the corrugated plates are placed diagonally, so as to deliver the water to the gutter from the right and left hand; and, in the case of a roll being employed in the middle, a gutter is placed at both ends of the roof to conduct the water to the eaves.

The *fourth* improvement consists of a mode of applying a thick coating of lead, or its alloys, to sheets of zinc or alloys of that metal. For this purpose a mould is used, in which the metal to be coated is placed, and the whole is then immersed in melted lead, or the mould and zinc plate are heated, and the lead poured on to the required depth. The coating may be made on one or both sides, and the coated sheet extended by rolling in the usual way. When cast zinc is thus coated, it is preferred to forge or hammer it before rolling, in order to break down the grain.

William Whitaker Collins, of Buckingham-street, Adelphi, civil engineer. *For certain improvements in the manufacture of steel.* (A communication.) Patent dated March 24, 1852.

In carrying these improvements into effect, the puddling furnace is to be charged with about 4 cwt. of grey pig iron and a large proportionate quantity of silicate of iron or other metallic oxide. The first stage of the boiling is then conducted as usual, but with this exception, that the mass of iron is not stirred or raked, and the impurities are thus burnt or got rid of. After the boiling has continued from fifteen to thirty minutes, which will depend upon the quality of the iron operated on, the mass will exhibit a tendency to rise, and the puddler must then begin to work vigorously, and continue to do so until the iron is ready for balling and being passed through the rolls or squeezers. The product of the above mode of operating is a fine close-grained iron, which, either in the state of mill or finished bars, possesses the property of combining readily with various proportions of carbon.

To convert the mill or finished bars of such iron into steel, they are placed, without previous cementation, into crucibles, together with the desired proportions of carbonizing matters, and are melted therewith, by which means a useful quality of cast steel will be produced. A finer kind, suitable for manufacturing edge-tools, such as chisels, &c., may be obtained by melting the mill or finished bars with a very large proportion of carbon, and subsequently remelting the product with fresh portions of the mill or finished bars.

Claims.—1. The melting of iron obtained from puddling furnaces worked as above described, in conjunction with the application of carbonizing substances, and whether such iron is in the state of mill or finished bars.

2. The re-melting of the product so obtained, when in a highly carbonized state, with fresh quantities of the same iron in the state of mill or finished bars.

Isaac Brookes, of Birmingham, manufacturer, and William Lutwyche Jones, of Birmingham aforesaid, manufacturer. *For certain improvements in stoves and other apparatus for heating.* Patent dated March 24, 1852.

Claim. — A peculiar arrangement of chambers, dampers, and flues described, wherein the heated air and products of combustion may be made to pass directly to the exit flue, or wholly or partially through chambers and descending and ascending flues before passing to the exit flue, which arrangement may be applied to close stoves, or to open or to partially open stoves, or to open fireplaces.

William Cole, of Birkenhead, Chester, architect, and Alfred Holt, of Liverpool, civil engineer. *For an improved method of preventing and removing the deposit of sand, mud, or silt, in tidal rivers in certain cases, and also in harbours, docks, basins, guts, or other channels communicating with the sea through tidal rivers or otherwise, the same being applicable in certain cases to other rivers or moving waters.* Patent dated March 24, 1852.

The "improved method" which the patentees adopt for preventing and removing the deposit of sand, silt, and mud, consists in forcing a jet or jets of water under pres-

sure against the same from below, so as to cause it to be agitated or disturbed, and raised into suspension in the water, and carried off by the water when receding. The necessary pressure of the jets of water may be obtained from any reservoir, natural or artificial, which possesses a sufficient head of water, or a force-pump, or other mechanical means may be adopted. In cases where there is a liability to the deposit of sand, &c., the patentees lay down perforated pipes, through which they cause water under pressure to be injected into that holding the sand, &c., in suspension. This operation is to be performed, when in a tidal river or tideway, when the tide is at about half ebb, in order that the disturbed sand, mud, or silt may be the more readily carried off by the receding water.

Claim.—The preventing or removing the deposits of sand, silt, and mud, by means of numerous shoots or jets of water injected into the deposit from below, or into the water in which such deposit is held in suspension.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Henry Medhurst, of Clerkenwell, Middlesex, engineer, for improvements in water-meters, and in regulating, indicating, and ascertaining the supply of water and liquids. September 27; six months.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in the manufacture of boots and shoes, part of which said improvements are also applicable to the manufacture of various other articles of dress. (Being a communication.) September 30; six months.

Moses Poole, of London, gentleman, for improvements in the manufacture of combs. (Being a communication.) September 30; six months.

Sarah Lester, of St. Peter's-square, Hammersmith, Middlesex, executrix of the late Michael Joseph John Donlan, of Rugeley, Staffordshire, gentleman, for improvements in treating the seeds of flax and hemp, and also in the treatment of flax and hemp for dressing. (Being a communication from the said M. J. J. Donlan.) September 30; six months.

Christopher Nickels, of York-road, Lambeth, manufacturer, and Benjamin Burrows, of Leicester, for improvements in weaving. September 30; six months.

Henry Gardener Guion Jude, of Lower Copenhagen-street, Barnsbury-road, Islington, for improvements in the manufacture of type. (Being a communication.) September 30; six months.

Charles Billson, of Leicester, manufacturer, and Caleb Bedells, of Leicester aforesaid, manufacturer, for improvements in the manufacture of articles of dress where looped fabrics are used, and in preparing looped fabrics for making articles of dress and parts of garments. September 30; six months.

Edouard Moride, of Nantes, France, for certain improvements in tanning. September 30; six months.

William Hunt, of Stoke Prior, Worcester, manufacturing chemist, for certain improved modes or means of producing or obtaining ammoniacal salts. September 30; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Sept. 23	3375	Christopher Dam	Southampton	Perpetual daily indicator.
24	3376	Samuel Whitfield and Jean Teychenné	Birmingham	Bedstead convertible into ottoman and sofa.
25	3377	W. D. Hornsby Thos. A. Burriage John L. Barber	Great Bartholomew-close St. John's-square Cotton-mills, St. Martin's-lane	Netting-pattern type.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Sept. 29	472	Pierre D. Nolet	Castle-street, Holborn	Copying-press.

CONTENTS OF THIS NUMBER.

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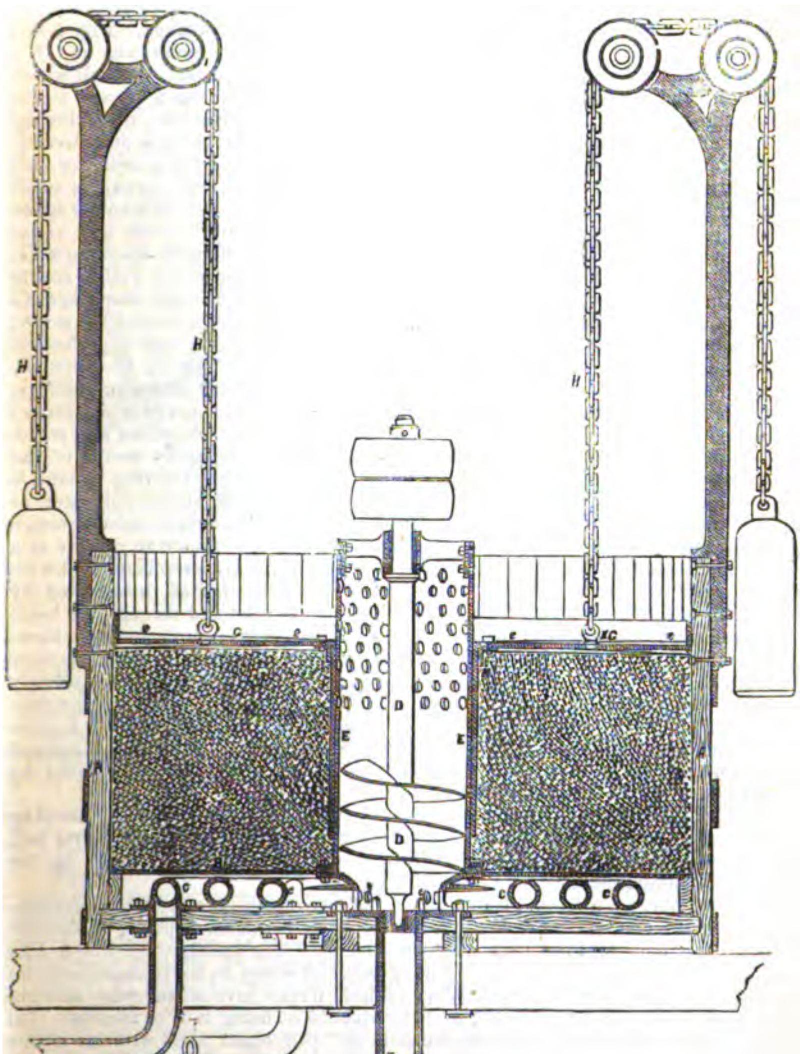
MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 1522.] SATURDAY, OCTOBER 9, 1852. [Price 3*d*., Stamped 4*d*.

Edited by R. A. Brooman, 166, Fleet-street.

CROCKFORD'S PATENT BREWING APPARATUS.

Fig. 2.



CROCKFORD'S PATENT BREWING APPARATUS.

(Patent dated March 8, 1852. Specification enrolled September 8, 1852. See *ante*, page 238.)

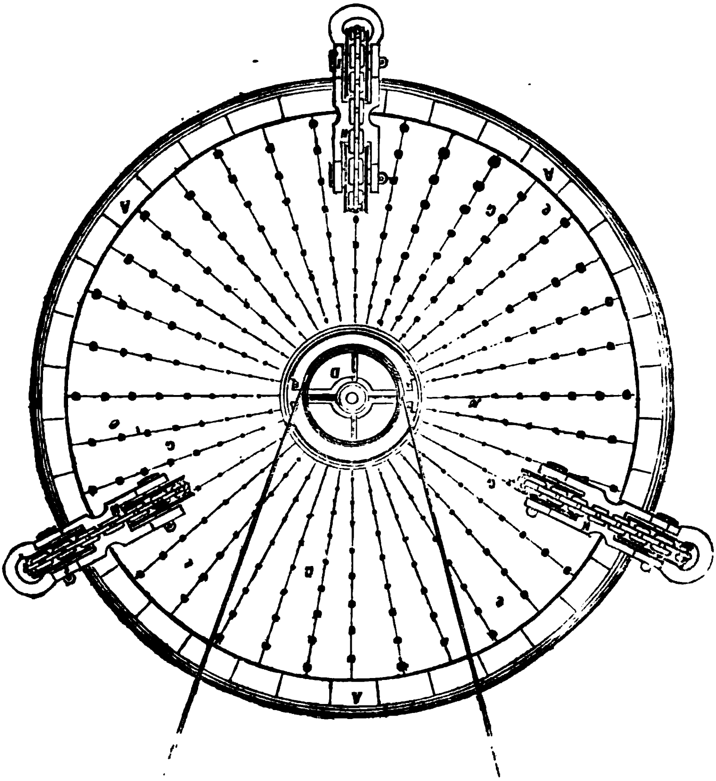
Specification.

Firstly. My invention has reference to the process of mashing, and apparatus employed therein, and consists in certain improved modes of construction and manipulation, which have for their object to produce and keep up a constant state of mechanical circulation among the particles of the liquor, whereby I am enabled to obtain a considerable increase in the quantity of extract, and also to ensure that the beer produced shall be of the best quality. A mash-tun, constructed according to this part of my invention, is represented in the engravings annexed. Fig. 1 is a ground plan, and fig. 2 a sectional elevation. A is an open circular vat, and B a perforated false bottom, beneath which a coil of tubing C is laid, through which either steam or hot water, or hot air may be circulated. So far the apparatus is the same as the mash-tun in use; but for the purposes of my invention, the following additions and modifications are made. In the centre of the vat there is placed vertically a screw (of two, three, or more blades) D, which is enclosed in a casing or well E, which is perforated for about half its length downwards with numerous small holes, and communicates at bottom through a circle of holes *c c* with the hollow space beneath the false bottom of the vat; and on to this casing or well there is a collar K fitted, which carries radiating from it a channelled and perforated diaphragm G, which fits exactly into the circular space between the exterior of the well or casing and the inner periphery of the vat, yet not so exactly but that the diaphragm G shall be at full liberty to be moved up and down on the well or casing of the screw, as on a spindle or guide-rod, and so as to close more or less the upper perforated portion. This diaphragm G is wholly separate and distinct from the false bottom, and raised and lowered independently of it by means of weighted chains and pulleys, H I. The mode of manipulating with the apparatus as thus improved is as follows: —The grist is thrown into the tun in the usual way, and the channelled and perforated diaphragm G lowered to within a few inches of the grist by means of the chains and pulleys H I. The quantity of liquor required for the brewing in hand is then taken over at any temperature under 160° Fahr., and the steam, hot water, or hot air (whichever is the heating medium employed) is then made to circulate through the tubing coiled under the false bottom. The screw is now caused to revolve at a considerable rapidity, which may be done either by hand or by strap connected with a steam engine or other first mover. As the liquor becomes heated, it is forced by the rotation of the screw up through the superincumbent grist and through the holes in the perforated diaphragm G, from the surface of which it is conducted by a number of converging channels *e e* into the well or casing of the screw, whence it is once more spread over the coil of heating pipes. And so the operation goes on unceasingly until the mashing is completed; all fresh accessions of heat by the liquor being successively and equally diffused or circulated throughout the entire mass. I have directed the liquor to be taken over at any temperature under 160° Fahr., but instead of this it may be taken over quite cold, and its temperature afterwards raised by means of the steam, hot water, or hot-air tubes.

I consider the means and apparatus which I have directed to be used for keeping up continuous circulation of the heated liquor to be the best adapted for general use, but any other equivalent mechanical means may be substituted for them, as, for example, a common forcing-pump or fan-blower.

Secondly. My invention has reference to the instrument employed for ascertaining the quantity of alcohol in wines, beers, ales, and cordialized spirits, commonly known by the name of Field's Patent Alcoholmeter. The principle on which this instrument is constructed is, that the boiling point of every liquid is dependent on the quantity of alcohol which it contains; entirely irrespective of any other matters which may be contained therewith; and the practice in using it is to ascertain that boiling point by immersing a thermometer in an open boiler filled with the liquor to be tested. But this practice is open to the objection that a portion more or less

Fig. 1.



of the alcohol is sure to escape before the boiling point is reached. To obviate this source of error, I add to the boiler a condenser of any approved form, collect therein whatever portion of the alcohol is exhaled previous to actual ebullition, and return it to the sample of liquor under examination to be included in the general estimate.

PROFESSOR POTTER'S "ELEMENTARY MECHANICS."

Sir,—As many of your readers seem to take an interest in the solution of mechanical problems, and several of them have probably some acquaintance with Professor Potter's "Elementary Mechanics," I beg to call attention to several of the problems which he has solved, and to the results which he obtains entirely different from those at which I arrive.

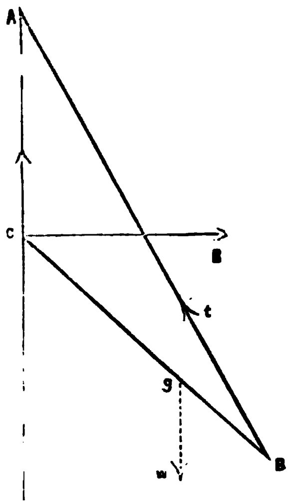
As I cannot see my way through Professor Potter's reasoning, perhaps that gentleman might not consider it unworthy the position which he occupies in the educational world, to clear up the difficulties which I believe have beset others as well as myself. At page 52, of the edition of 1848, this problem is proposed: "A heavy beam has one end resting against a smooth wall, and the other tied to a cord, which is fastened at a point directly above the point where

the beam rests; find the forces which keep the beam in equilibrium."

I subjoin his solution, putting in *italics* those statements which I conceive to be objectionable.

"Let C B be the beam in the figure,

Fig. 1.



A B the cord; A and C being points on the wall. The weight of the beam (W), the distance ($Cg=a$) of the centre of gravity from the end against the wall, the length of the beam (l), the length of the cord (c), *and the distance* (h) *of the points A and C* must be given. *The angles A, B, C will be known.*

Let t = the tension in the cord.

The beam will press at C against the wall, and *we may resolve this pressure into a vertical and horizontal part;* the latter, perpendicular to the wall, will be destroyed by its reaction (R); but since the wall is smooth, *the vertical component can be balanced only by an opposite force P.*

If we take into account all the forces which act on the beam, we may treat it as a free body in equilibrium from their action, and apply the conditions of equilibrium investigated in chapter IV. namely,

$$\Sigma(X1=0$$
$$\Sigma(Y1=0$$
$$\Sigma(Xy-Yx)=0.$$

Therefore resolving the forces vertically and horizontally, we have

$$P+t\cos. A-w=0 \qquad (1),$$
$$R-t\sin. A=0 \qquad (2).$$

Since the origin of co-ordinates may be taken anywhere, we may fix it at a point where we avoid moments of the unknown forces; therefore fixing it at C, we have, for the equation of moments,

$$w.\sin. C\times Cg-t.\sin. B\times CB=0,$$

or

$$t=w\frac{a.\sin. C}{l.\sin. B}-w\frac{a}{l}\cdot\frac{c}{h},$$

which gives the tension of the cord.

Substituting in the equations (1) and (2), we have

$$R=w\frac{ac}{lh}.\sin. A,$$

which gives the pressure against the wall.

$$P=w\left(1-\frac{ac}{lh}\cos. A,\right)$$

which gives P, as required."

Now, in the statement of the problem no mention is made of any force but the weight of the beam and the tension of the string as producing equilibrium; and the necessity of the action of this force P, seems by no means clear. The wall is said to be perfectly *smooth*, how then can the beam produce a *pressure* on the wall other than the *Normal Pressure?* The true question, I conceive, is to find the *position of equilibrium* in the circumstances stated in the problem, and the tension of the string.

Let $Ac=x$ *which is to be determined*, and let $\angle CAB=\theta$, R the mutual pressure of the beam and wall of course normal to the latter. The equations of equilibrium then, are

$$t\cos.\theta-w=0 \qquad (1),$$
$$t\sin.\theta-R=0 \qquad (2),$$

and taking moments about C

$$w.Cg\sin. C-t.CB\sin. B=0 \qquad (3);$$

but from the geometry of the case, we have

$$\sin. C=\frac{c}{l}\sin.\theta \qquad (4),$$

$$\sin. B=\frac{x}{l}\sin.\theta \qquad (5),$$

$$\cos.\theta=\frac{c^2+x^2-l^2}{2xc} \qquad (6),$$

and by virtue of (4) and (5) equation (3) becomes

$$w \,.\, ac - t\, l\, x = 0,$$

and eliminating t by (1) we get

$$a\, c \cos.\ \theta - l\, x = 0,$$

or

$$a(c^2 + x^2 - l^2) - 2\, l\, x^2 = 0 \qquad (7),$$

$$\text{or } x = \sqrt{\frac{a(c^2-l^2)}{2l-a}}$$

$$\text{and } \cos.\ \theta = \frac{l}{c}\sqrt{\frac{c^2-l^2}{a(2\,l-a)}}.$$

That equilibrium may be possible, $\angle\,\theta$ must be real, and $\therefore$ cos. θ not >1. Hence we have

$$l^2(c^2-l^2) \text{ not } > a\,c^2(2l-a),$$
$$\text{or } c^2\, l^2 - l^4 \text{ not } > 2\,a\,c^2 l - a^2 c^2,$$
$$\text{or } c^2(a^2+l^2) \text{ not } > 2\,ac^2 l + l^4,$$

a relation which must hold between the quantities a, c, l, that equilibrium may be possible.

It would be more satisfactory to take the case which nature always presents—viz., of a *rough*, and not a perfectly smooth plane. Let ϕ = limiting angle of resistance. Draw CP and CP[1], making $\angle\,\phi$ with CR, one above and the other below: the former is direction of (R) the pressure on the plane when the beam is on the point of sliding downwards, and the latter when it is on the point of sliding upwards. Hence our equations (1) and (2) become

$$t \cos.\ \theta - w \pm \text{R} \sin.\ \phi = 0 \ldots\ldots\ldots\ldots\ldots\ldots (1)$$
$$t \sin.\ \theta - \text{R} \cos.\ \phi = 0 \ldots\ldots\ldots\ldots\ldots\ldots (2)$$
$$\text{and } \therefore t \cos.\ (\theta \mp \phi) - w \cos.\ \phi = 0 \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Hence equation (3) becomes

$$ac \cos.\ (\theta \mp \phi) - lx \cos.\ \phi = 0, \text{ or}$$

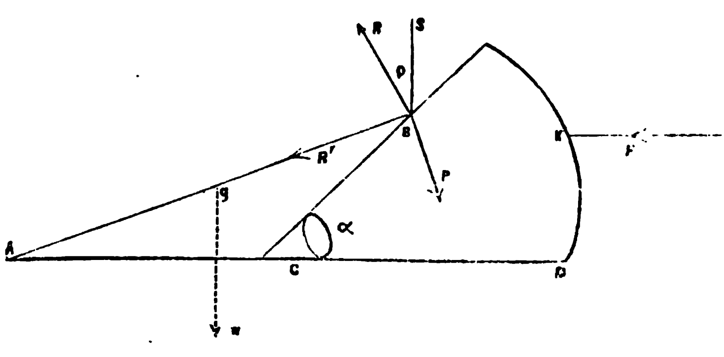
$$\frac{a}{2x}\cos.\ \phi\,(c^2+x^2-l^2) \pm \frac{a}{2x}\sin.\ \phi\,\sqrt{4\,c^2\,x^2-(c^2-l^2+x^2)^2} - lx\cos.\ \phi = 0,$$

which gives two values of x corresponding to the superior and inferior states of equilibrium. x being known, θ is known from (6) and t from (8).

Again; page 58. Problem 13.

"A heavy beam turns about a hinge at the lower end, with the other end pressing on an inclined plane, a part of the surface of a body which rests on a smooth horizontal plane passing through the hinge; find the horizontal force necessary to keep the body from moving.

Fig. 2.



"Let BCD be the body resting on the smooth horizontal plane ACD. Let AB be the beam turning about the hinge A; let g be the centre of gravity of the beam, at which its weight w acts.

"The body is to be in equilibrium from the pressure of the beam upon it at B, and a horizontal force F acting at same point K; and the beam is to be in equilibrium from the reaction (R) of the inclined plane upon it at B, and its own weight acting at g.

"*The point B is in equilibrium, from the reaction* (R) *perpendicular to the inclined plane, the reaction* (R^1) *of the beam in the direction of its length, and a force* (P) *acting perpendicularly to A B, arising from the moment of its weight* (w) *about A.*

"Taking the moments about A for the equilibrium of the beam, we avoid expressions involving R^1, and have

$$w\ Ag\,.\cos.\ gAC - RAB\,.\sin.\ ABR = 0."$$

Here I must remark, that I cannot understand why the equilibrium of the point B of the beam is to be provided for in addition to that of the beam itself; moreover, I conceive that when there is equilibrium the pressure of the beam on the plane must be *equal* and *opposite* to that of the plane on the beam; and that what Professor Potter states about the reaction of the beam in the direction of its length, and a force perpendicular to A B, arising from the moment of its weight about A is quite unintelligible. According to his view of the case, Professor Potter forms his equation of moments incorrectly; he ought to have an additional term $+\mathrm{P.AB}$ in it. Thus his equation should be (on his own principles)

$$w.Ag\cos.gAC - R.AB\sin.ABR + P.AB = 0.$$

I shall not pursue this solution of Professor Potter's further, but give one of my own, introducing also the condition of friction. We will suppose the body to be in *the state* bordering on motion. Draw BS, making with BR the $\angle\phi$ (limiting angle of resistance between beam and inclined plane.) Also let ϕ^1 be the limiting angle of resistance between the body and horizontal plane. Then the pressure of the plane on AB, *which is equal and opposite* to the pressure of the beam on CB, acts in the direction BS; let it be R.

Then we have for equilibrium of AB

$$w.\ A\,g\cos.\ g\ AC - R\ AB\sin.\ ABS = 0,$$

Let $\angle BAC = \beta$, $\angle$ of inclined plane $= a$, $A\delta.\ g = a$, $AB = l$. Then

$$R = \frac{w\,a\cos.\beta}{l\cos.(a-\beta-\phi)}\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1).$$

Also for equilibrium of the body resolving the forces vertically aud horizontally, putting W = its weight.

$$R\cos.(a-\phi) + W - R^1\cos.\phi^1 = 0$$

$$R\sin.(a-\phi) + R^1\sin.\phi^1 - F = 0$$

Whence $R\sin.(a-\phi+\phi^1) + W\sin.\phi^1 - F\cos.\phi^1 = 0$, or

$$w\frac{a\cos.\beta.\sin.(a-\phi+\phi^1)}{l.\cos.(a-\beta-\phi)} + W\sin.\phi^1 - F\cos.\phi^1 = 0,\text{ or}$$

$$F = W\tan.\phi^1 + \frac{w\,a\cos.\beta\sin.(a-\phi+\phi^1)}{l\cos.\phi^1\cos.(a-\beta-\phi)}$$

Again, example 14—

"Solve the last example by taking the conditions of equilibrium at the point B, and show that the whole pressure on the hinge

$$A = \omega\left(\sin.\beta + \frac{a}{l}\cos.\beta\tan.\overline{a-\beta}\right\}.$$

This last expression is evidently obtained on the supposition that this pressure acts in BA, which is not correct; for on that supposition R^1 is the pressure on the hinge, and resolving the forces parallel to BA, remembering that

$$AB\,R = 90^\circ - (a-\beta),\text{ we have}$$

$$R^1 - R\sin.(a-\beta) - w\sin.\beta = 0,\text{ or}$$

$$R^1 = w\left(\sin.\beta + \frac{a}{l}\cos.\beta\tan.\overline{a-\beta}\right\}.$$

To obtain the pressure on the hinges correctly, proceed as follows:—Let X, Y be its components in a horizontal and vertical direction. Then

$$X - R\cos.(a-\phi) = 0$$

$$Y - w + Rw\sin.\overline{a-\phi} = 0, \text{ or}$$

$$\text{or } X - wa\frac{\cos.\beta.\cos.\overline{a-\phi}}{l\cos.(a-\beta-\phi)} = 0$$

$$Y - w + \frac{wa\cos.\beta.\sin.\overline{a-\phi}}{l\cos.\overline{a-\beta-\phi}} = 0.$$

and whole pressure on the hinge

$$= \sqrt{X^2+Y^2} =$$

$$= w\sqrt{1+\frac{a^2}{l^2}\frac{\cos.^2\beta}{\cos.^2(a-\beta-\phi)} - \frac{2a\cos.\beta\sin.\overline{a-\phi}}{l\cos.(a-\beta-\phi)}}.$$

$$\text{Or if } \phi = 0, \text{ this } = w\sqrt{1+\frac{a^2\cos.^2\beta}{l^2\cos.^2(a-\beta)} - \frac{2a\cos.\beta\sin.a}{l\cos.(a-\beta)}},$$

a very different expression from Professor Potter's. Also, if θ be the angle which the pressure on the hinge makes with the horizontal line, CD.

$$\text{Tan. }\theta\frac{Y}{X} = \frac{l\cos.\overline{a-\beta-\phi} - a\cos.\beta\sin.\overline{a-\phi}}{a\cos.\beta\cos.\overline{a-\phi}},$$

$$= \frac{l}{a}\frac{\cos.(a-\overline{\beta-\phi})}{\cos.\beta.\cos.\overline{a-\phi}} - \tan.\overline{a-\phi}.$$

$$= \frac{l}{a}\left\{1+\tan.\beta\tan.\overline{a-\phi}\right) - \tan.\overline{a-\phi},$$

or neglecting friction,

$$\text{Tan. }\theta = \frac{l(1+\tan.a\tan.\beta) - a\tan.a;}{a}$$

but according to Professor Potter θ *ought to be* β.

Professor Potter's work on Mechanics, emanating from a professor at University College, must needs have a large circulation. If, therefore, his mode of treating problems, including pressures of beams on surfaces be incorrect, the mischief accruing therefrom to students must be proportionably extensive. If I am in error, which I do not apprehend will prove to be the case, I should be glad to be set right.

I am, Sir, yours, &c.,

INDAGATOR.

September 30, 1852.

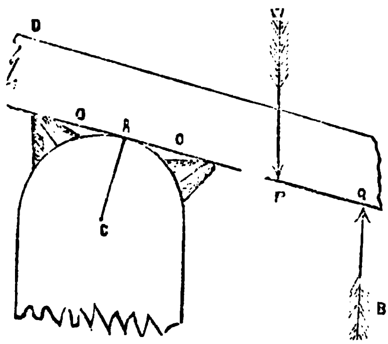
THE EXCISEMAN'S STAFF QUESTION.

Sir,—The fiery bolt of "*Indagator*" having had a few days to cool down, it may now be approached without danger, and, in good sooth, a strange, uncouth mass of incongruous materials it naturally enough turns out to be.

There can be little wonder, indeed, that a person in the hissing temperature at which "*Indagator*" writes, should mistake the most obvious meaning of words which seemed to oppose his favorite views; but whether his difficulty to understand my "*profound remark*" arises from his own effervescing state of mind, or from some ambiguity in my expression of a fact, I beg to offer the following detailed explanation of what I meant to convey:

Referring to the annexed diagram, if a mass DQ *roll* upon another mass C, it is the opinion of philosophers (*Colomb*, *Morin*, *Moseley*, &c.) that, whatever be the nature of the resistance opposed to the motion, it is evidently equivalent to that of an obstacle, real or imaginary, which the rolling mass may be supposed

at every instant to be in the act of surmounting. Let this obstacle be represented at OO in the diagram, and let it be such as would crush under the weight as the mass revolves.



Let W = the weight of the mass acting vertically *downwards* at P, B = another pressure acting vertically *upwards* at Q, R = the resistance at OO, A the point of contact about which the moments are measured, AQ = a AP = β, and AO = δ.

Now when the weight W is about to preponderate, and the mass to turn downwards about A, by the principle of the equality of moments

$$a. \text{ B} + \delta. \text{ R} = \beta. \text{ W.} -$$

Again, when the pressure B is about to preponderate,

$$a. \text{ B} - \delta. \text{ R} = \beta. \text{ W.} -$$

Generally

$$\therefore a. \text{ B} \pm \delta. \text{ R} = \beta. \text{ W.} -$$

the sign $\pm$ being taken according as the mass DQ is in the *inferior* or *superior* states bordering on motion.

If the bodies move upon each other in the manner of an axle and box, a precisely similar equation will result, but should be obtained by a different but well-known method.

Now in the case of the Exciseman's Staff, the above equation, or one exactly similar, obtains in every position from that in which the lower edge AQ of the staff is horizontal, to that position in which it is about to *slip* at A; and even *in the very limit of slipping* this equation holds good. I maintain, therefore, that every equation of moments which does not take account of this resistance, and its effect upon the equilibrium, must be *erroneous*, notwithstanding all that has been individually and collectively said to the contrary.

The extraordinary mistake to which I referred, and which still appears to me unaccountable, is this:—That such continuous efforts should be made to prove that the inclination of the cylinder, or its *angle of position* at the time of observation, must have been equal to the angle of friction; whereas it may have been in *any position* from the horizontal to that angle of inclination at which it was about to slip, within which range the friction of *slipping* does not apply.

The vanity of "*Indagator*" has again betrayed him into a general enunciation of principles which might well indeed have been spared. The person to whom he addresses this second essay is daily engaged in the actual application of mechanical science to the useful purposes of life; he is constantly in the habit of consulting such authorities as *Moseley*, *Hann*, *Tate*, and *Gordon*, and other sound authors of earlier date; and with these infallible guides at his fingers' ends, he cannot but regard it as a stretch of assurance to expect that he should attend to the enunciation of any principle which proceeds from "*Indagator.*"

But if "*Indagator*" be unfortunate as a philosopher, who will not admit the fire and fury, the strength and beauty of his poetical inspirations? The current of pure poetry which flows "*in the direction of the prop,*" the metaphorical allusion to the "*fundamental doctrine of forces,*" and the ingenious invention of the "*equations of equilibrium,*" are all magnificently grand in their own way! And who will refuse the meed of admiration to that splendid flight of fancy in which he soars aloft into the sweet-smelling regions of culinary art, there to cull his beautiful imagery from the enchanting panorama of—"*plum-pudding?*" Such efforts of thought, such grasp of intellect, and such chaste delineations of the sublime and solid, are worthy the poets and philosophers of other than our degenerate days!

But "*Indagator*" has flown—actually bolted, leaving his own "*equation of moments*" and "*the little community*" in nearly the same awkward predicament:

Great "*Indagator*" flies—a *frog* renown'd
For boastful speech, and turbulence of sound;
Return he hence, to stem the turbid flood,
Or sport and sputter in his native mud!

And now, Sir, I venture to prophecy that, should even a *seventeenth solution* to the celebrated question of the Exciseman's Staff ever see the light, it will be just a *seventeenth* proof that this ill-fated and badly-treated question is *indeterminate*, and that all the combined powers of mechanical science, as at present developed, are not capable of determining the weight (W) of that celebrated and historical staff.

I am, Sir, yours, &c.,

T. S.

Sept. 30, 1852.

THE EXCISEMAN'S STAFF QUESTION.

Sir,—Your correspondent, "Indagator," has so completely transfixed the Wexford sage on his controversial spear, that scarcely anything remains to be done, except to leave him to twist and wriggle for the amusement of your readers. It has really been a treat to observe the exertions of this *slippery gentleman* to escape from his pursuers, as stone after stone was upturned under which he had for the moment taken refuge, nor has it been less interesting to witness the amount of mud he has thrown up behind him whilst vainly attempting to regain a safe retreat in his native element. As the matter *now* stands, Tebay = "Workman" = "Indagator," so far as the Exciseman's Staff Question is concerned; and it may be further added, without intending any disparagement, that, in *principle* and abstracting from friction, all these solutions agree with that given by Mr. Wolfenden in the *Mathematical Companion* nearly sixty years ago. Mr. Smith occupies the unenviable position of "Tom all alone" in the question, and with regard to the presence of friction in the equation

"$W.PM \pm F = B.PN$......(3),"

when F *acts at the centre of moments* A, is still (*Mech. Mag.*, No. 1521, p. 268) determined to "know nothink at all" on the subject, notwithstanding my former letter, and "Indagator's" pains to instruct him. When the Wexford sage first uttered this oracular equation, he brought it forward *de facto* as *the* equation of moments, *and used it as such* (No. 1502, p. 405, col. 1), but upon being called upon to relax his "*premature* determination" to take the ground whilst this difficulty remained unexplained, the sage vouchsafed another response (No. 1508), in which he declared that the equation (3) was "*intended* as a *mere type* rather than a precise expression of quantities!" This, indeed, was *slippery* enough, but it by no means equals in audacity and coolness the *trick* attempted upon "Workman," when parading his *correct* equations (1), (3), and (6), as pointed out by "Indagator" in his last communication. So far as mechanical *principles* and their application to the Exciseman's Staff Question are concerned the slippery "philosopher" may safely be left in the hands of Indagator, but since Mr. Smith is evidently skilled in the occult qualities of *clairvoyance*, and can readily divine what "looms in the future," it may not be amiss to explode that very pleasant fiction of "a coterie of amiable gentlemen" which has afforded such a fund of amusement for the discomfited Wexford sage. Most of his remarks on this subject are pitiful in the extreme, and certainly beneath contempt; nor can they injure anyone's reputation, however insignificant; yet, since "Indagator" volunteered on Mr. Smith's behalf to condemn the practices of similar "little cliques," it may interest both himself and your readers to learn that, in the case of those who have interested themselves in the Exciseman's Staff Question, *no such coterie exists*. I have made due inquiry on the subject, and am in a position to state that Mr. Wilkinson (who first introduced Mr. Tebay's solution) assures me he has no acquaintance with "Workman," knows nothing whatever of "Indagator," and never saw his friend Mr. Tebay but once in his life. Mr. Tebay informs me he is similarly circumstanced, and so is your correspondent "Mechanicus." None of them, however, appear to have learnt *politeness* in the same school with Mr. Smith. The terms cited by the Wexford sage with so much parade are, consequently, the "complimentary terms" of no "little circle" of "amiable gentlemen," the "*servility*" of "Workman" has no foundation in fact, and all the pleasantries of the *slippery gentleman* with respect to reciprocating influences, are merely so much mud thrown

behind, in order to cover his retreat from the prongs of his pursuers.

If any apology should be needed for the tone assumed in this note, it may be found in Mr. Smith's last communication to this Journal. He certainly cannot object to receive a small return of the currency he himself is so liberal to distribute. The Wexford sage, however, appears to be beyond recovery, even under the able tutelage of "Indagator," and hence, following the example of that gentleman, I now leave him "*all alone*" in his glory, surrounded by such writers as "Colomb, Morin, and *our own* Moseley," who will no doubt assist him much in his meditations on the properties of $\underline{+}$F, and prevent him from *slipping* and *rolling* so uncouthly in future.

I am, Sir, yours, &c.,

MECHANICUS.

October 4, 1852.

WHITE'S PATENT IMPROVEMENTS IN SHIP-BUILDING.

(Patentees Messrs. John and Robert White, of Cowes, Isle of Wight, ship-builders. Patent dated March 24, 1852. Specification enrolled September 24, 1852.)

Fig. 1.

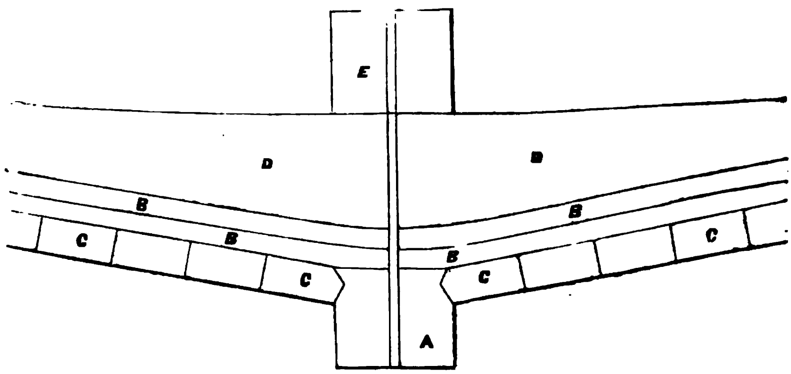
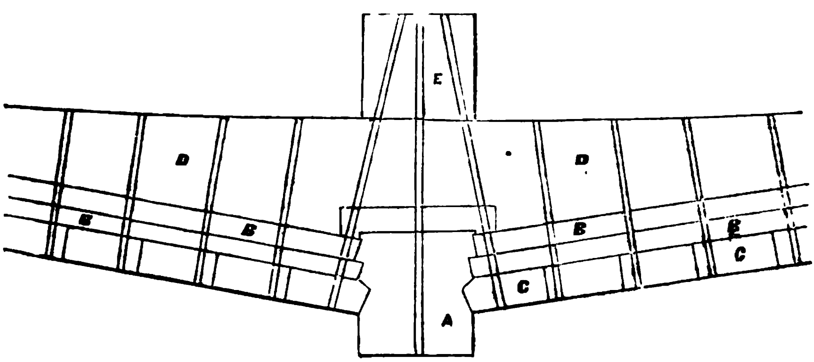


Fig. 2.



We have pleasure in laying before our readers an important improvement in ship-building, which has the advantage of being exceedingly simple and easy of application Messrs. John and Robert White, of Cowes, finding that

the keel of ships built with diagonal planking was very much weakened by the diagonal planks being carried over and across it, conceived the idea of making the diagonal planks terminate in rabbits cut on each side of the keel. By this arrangement the keel is capable of being of the same depth and thickness from stem to stern, and the diagonal planks serve to support it. The whole ship is necessarily much strengthened. We understand that two large steam ships are being laid down on this plan by Messrs. White, one of which is for the Royal West India Mail Steam-Packet Company. The invention will be better understood by the following description and engravings, which we take from the patentees' specification:

Whereas in ships as now built with diagonal planking, the main-piece of the keel is much weakened to allow of the diagonal planks being carried over and across it; the keel becoming, in fact, a hanging keel, brought on after the diagonal planking has been laid, supported only by the outer skin or coat of longitudinal planks, together with bolts. Now, our invention consists in forming a solid keel from stem to stern, of the same thickness and depth throughout, with grooves or rabbets cut therein for the reception of the diagonal planks, which do not cross the keel, but terminate on each side of it in the grooves or rabbets. The keel being laid in a continuous length, the floor timbers crossed, and the kelson laid and bolted thereto at the commencement of building, we obtain a permanent and solid foundation on which to construct the ship; the planking of the bottom is facilitated, and one length of planking extends from the keel to the gunwales, the ship is much stronger than if the keel were cut to allow of the diagonal planks being carried across it, and we are also enabled to build ships with diagonal skins or coats of any rise of floor.

Fig. 1 is part of a midship section of a vessel constructed according to the present method of diagonal ship-building. A is the hanging keel; BB the diagonal planking; CC the outer and longitudinal planking by which, together with bolts, the hanging keel is supported. DD are the floor timbers, and E is the kelson.

Fig. 2 is part of a midship section of a vessel constructed according to our improvements. A is the keel, solid throughout, having rabbets on each side for the reception of the ends of the diagonal planks BB, and the outer planks CC. DD are the floor timbers, and E is the kelson. The keel is here supported by both the diagonal and longitudinal planks, and the ship is thereby consequently much strengthened.

MATHEMATICAL PERIODICALS.

(Continued from page 247.)

XXVII.—*The Mathematical Repository.*—(*Original Papers Continued.*)

Art. XVIII. Part II., Vol. VI. On the Computation of Superficies and Solids. By Mr. W. S. B. Woolhouse.

1. To compute the Surface of a Triangle.

2. To find an Expression for the Surface of a Quadrilateral.

3. To determine the area of a Triangle formed by the connection of three points in space.

4. To determine the solidity of a Triangular Prism.

5. To find the Solidity of *any* Pyramid.

[The whole of these investigations are effected by means of the co-ordinants of each point concerned, and are conducted with that elegance and perspicuity which always characterises Mr. Woolhouse's writings. At the close of the first proposition, by supposing the triangle to *vanish*, he derives the *criterion* for *three* points to range in the same straight line, and Prop. 3 furnishes a purely *analytical* proof "that the square of any surface is equal to the sum of the squares of its orthographic projections on any three rectangular co-ordinate planes."]

Art. XIX. New Researches in Spherical Trigonometry. By Mr. T. S. Davies, of Bath.

[This paper is one of the most curious and interesting discussions to be found on the subject of spherical trigonometry. It relates to "the radii R_1 R_1, R_2, &c., r_1 r_1, r_2, &c., of the circles described in and about a spherical triangle," and extends the researches of Lagrange, Lowry

and Lardner, to the radii, &c., of the circles inscribed and circumscribed about his own "Associated System of Spherical Triangles," the importance and utility of which distinction he had previously pointed out in the Supplement to Young's Trigonometry. Various Spherical analogues to known plane theorems are pointed out as he proceeds, and in the copy of the *Repository* from which I quote, a number of other collateral properties and inquiries are suggested in the M.S. notes, which he has appended to the paper. From the fact of the article having "*to be continued in our next*," it would seem that much more on the subject will be found in his M.S. remains, since he intimates, that although he has given a considerable number of curious theorems, he has selected from his "notes only a very few of these which have been deduced." Dr. Rutherford, in the Appendix to the *Gentleman's Diary* for 1837, and Messrs. Fenwick and Beecroft, in Vol. I. of the *Mathematician*, have added considerably to this class of researches.]

Art. XX. and XXV. On the Deviation between two Curves, in answer to a Note by Mr. Woolhouse inserted in the *Repository*. By Mr. T. S. Davies, of Bath.

Reply to the preceding Article. By Mr. Woolhouse.

[These papers relate to the determination of the deviation of a two-cycloidal curve, and took their rise in consequence of Mr. Woolhouse pointing out an erroneous principle in Mr. Davies's solution to Question 503 of the *Repository*. In the first article cited, Mr. Davies replies to Mr. Woolhouse's objections, but as is too often the case in controversies, the *main* points are almost wholly overlooked, whilst *minor* matters are dwelt upon at considerable length: this is succinctly pointed out by Mr. Woolhouse in his reply, where he puts the matter in so forcible a light that his opponent did not fail to see his mistake, for in Mr. Davies's copy of the *Repository*, now in my possession, he has added a marginal note to the solution in dispute, stating that he was led into "error by supposing that M H (*see* fig.) is *normal* to the outer cycloid."]

Art. XXI. On the Solution of a Partial Differential Equation. By William Sutcliffe, Esq., A. M., of Bath.

Art. XXII. On the figure of a Homogeneous Mass of Fluid revolving about an axis with a given uniform angular velocity. By the Rev. Brice Bronwin.

[This paper is an improvement upon Laplace's investigation in the *Mechanique Celeste*, and determines the figure to be "that of the ellipsoid of revolution."]

Art. XXIII. On the Arbelon. By Mr. T. S. Davies.

[This article is a continuation of Mr. Davies's solution of Question 531 of the *Repository*, and contains a considerable number of the properties of the "Arbelon, or Cobler's Knife," as the figure was termed by the Ancient Geometers. The question which gave rise to the discussion was proposed by N. Y. (*John Lowry*), and was also answered by Mr. John Baines, of Thornhill, one of Mr. Davies's early friends. Some of the principle properties of the figure are investigated geometrically in the *Mathematical Collections of Pappus*, Book iv., Prop. 12—18, and also in Foster's edition of the "*Lemmata Archimedis.*" Mr. Davies here applies the properties of *radial axes* and *poles* of *similitude* to the fundamental properties, and thence deduces a considerable number of interesting collateral ones. More recently the veteran geometer, Mr. John Whitley has revived the discussion of this figure in the Prize Question (1688) of the *Diary* for 1842, whence a number of interesting investigations of other properties may be seen by the proposer, Professor Gill, Messrs. Godward, Hearn, Weddle and Beecroft. At the close of the article Mr. Davies announces his intention "to give a more general Theorem, which shall contain this (of the Arbelon) as a particular case, and which, at the same time, opens the road to a totally new series of properties of the figure;" but owing to the discontinuance of the *Repository* this intention was never realized.]

Art. XXIV. On the Power of Machines. By Mr. William Marrat, of Liverpool.

[This article forms a very instructive discussion on the application of D'Alembert's principle to machines, as explained and illustrated by Bossut. Several oversights of the latter author are here pointed out, and the correct expressions in each case deduced. Mr. Marrat was well

versed in the principles of mechanical philosophy, as appears from his Treatises on Mechanics (1810 and 1825), and in his later years almost wholly confined himself to the study of the great works of Lagrange and Poisson. He died in March last, in the 79th year of his age.]

Art I., Part III., Vol. VI. Pascal's Conics. Communicated by Mr. T. S. Davies, of Bath.

[This article is a translation of the celebrated "*Essais pour les Coniques*," originally published by Pascal in 1640, and contains, besides the now wellknown property of the *mystic hexagram*, that by Desargues concerning the *involution of six points*, which has since proved so fertile in consequences in the hands of M. Chasles and other continental geometers. The MSS. left by Pascal appear to be lost, but an interesting account of their nature is given at the close of the paper in a "Letter from M. Leibnitz to M. Perier, nephew of Pascal," dated "Paris, Aout. 30th, 1676." See also, on the same subject, two interesting papers by Mr. Davies, in the *Philosophical Magazine* for August and September, 1826.]

Art. II. A Demonstration of Lawson's Geometrical Theorems. By the late Rev. Charles Wildbore.

[This is a reprint of Mr. Wildbore's demonstrations of what are usually, but erroneously, termed "Lawson's Theorems," in consequence of his having published them at the end of his tract on "The Ancient Geometrical Analysis." They were originally published in the second volume of the new series of the "Memoirs of the Manchester Philosophical Society," to which they were communicated by Mr. Jonathan Mabbot. Mr. Wildbore conducts his investigations from *general* diagrams, and deduces the properties concerned in a strictly *geometrical* manner. He believes, *and correctly*, that "any person may, in a short time from hence, find out many times this number (60) of theorems, of like nature, and equally curious with these;" but he seems to be mistaken in his notion "whether or no this may not possibly be a specimen of a *method* of investigation similar to that of the ancients." The remnants of the Greek geometry afford no warrant that the ancients ever employed a *method* so effective for eliciting geometrical truths as that adopted by Mr. Wildbore.]

Art. III. On the Theory of Elliptic Transcendents. By James Ivory, A.M., F.R.S., &c., &c. From the *Philosophical Transactions* for 1831.

Art. IV. Proposition IV., Book IV., of the "Mathematical Collections of Pappus Alexandrinus," in a more general form; to which are added some propositions of a similar nature. By Dr. Matthew Stewart. From the "Essays and Observations, Physical and Literary," of the Philosophical Society of Edinburgh.

[This paper was originally published in Latin, but is here rendered into English, most probably by Mr. Davies or Mr. Leybourn. Several properties of the conic sections, and a porism relating to the circle, occur at the end of the propositions, which have since become of much importance in similar inquiries.]

Art. V. On Certain Properties of Plane Triangles, which are not generally known. By C. F. A. Jacobi. Translated and communicated by Mr. T. S. Davies, of Bath.

Chapter 1. On Transversals Intersecting in one Point.

[This chapter contains thirty-nine propositions relating to the triangle when cut by transversals, many of which are extremely curious and important. From internal evidence, it would appear that only the first portion of Jacobi's investigations are here printed.]

Pages 48-64; 150-1; 222-224, contain various notices respecting mathematical publications, and the contents of the transactions of several learned societies. An article headed "Nugæ," containing "constructions and expressions for the circumference of the circle," occupies pages 151-154, which were selected by Mr. Davies from the continental periodicals, and have since been transferred by him to pages 400, 1 of the twelfth edition of Hutton's Course, and No. 2 of the *Miscellanea Mathematica* in this Magazine. The same subject has been wellnigh exhausted by Messrs. Cockle and Godfray, in several recent volumes of the *Mech. Mag.*, and also in the *Mathematician*. The only "Obituary" in this volume is that of Sir John Leslie, which occupies pages 215-222; it was furnished by the late Mr. Galloway, and is somewhat severely condemned by Mr.

Davies, on page 5 of the preface to the second volume of his edition of "Hutton's Course." A portion of the Senate-house Problems for 1830, 1, were issued with several of the last Numbers of this volume, and these, forming pages 1 to 48, not only complete the volume, but mark the termination of one of the most extensive and important of our English mathematical periodicals.

T. T. W.

Burnley, Lancashire, Sept. 27, 1852.

(To be continued.)

SUCCESSFUL APPLICATION OF THE SCREW TO A NINETY-GUN SHIP, WITH ENGINES BY MESSRS. JOHN PENN AND SON.

The *Agamemnon*, 90, Captain Sir Thomas Maitland, C.B., when she went down the river on Friday afternoon, made a speed of upwards of 10 knots per hour until she arrived opposite Purfleet, when some small part of the engine which had been made of hardened steel, and too tightly fitted, became suddenly hot and set fast, which caused the breakage of an eccentric band. This slight damage was made good, and the corresponding part of the engine grounds so as to prevent the possibility of its heating and causing a similar accident. After the accident, she was taken by the *Monkey* and *African* steam-vessels to the deep water below Gravesend, where she anchored for the night.

On the following day (Saturday) she raised her anchor and started at 1 o'clock P.M., having on board Captain Sir Thomas Maitland; Commander Hall, who had joined on the previous day; Mr. Lloyd, chief engineer of the steam department at Somerset-house; Mr. Trickett, assistant to the chief-engineer at Woolwich Dockyard; Mr. John Penn, Mr. Hartree, and Mr. Matthew, of the firm that constructed her engines; Mr. Whitworth, engineer, Manchester; and Mr. F. P. Smith. The *Agamemnon*, in a few minutes after starting, began to draw the *Monkey* and *African* steam-tugs through the water, and it was amusing to witness the greatly increased rapidity of the engines of the smaller vessels when they were drawn by the screw steam-ship. When the *Agamemnon* arrived opposite the measured mile in Sea-reach the time was taken, and she accomplished the distance in 6 min. 24 sec., or at the rate of 9.375 knots, and the calculation gave her an average speed of upwards of 10½ knots per hour. As the *Agamemnon* proceeded onwards, her engines, of 600 horse-power, Messrs. Penn's patent trunk, worked in the most satisfactory manner, making 60 revolutions per minute without the slightest heating in any part. The cylinders of these magnificent engines are 78 inches diameter, equal to cylinders of 70¾ when the area of the trunk is deducted. The number of revolutions was from 58 to 60, or eight revolutions above the contract speed, and, notwithstanding this high velocity of engines of 3 feet 6 inches in stroke, not the slightest jarring in any of the fixed parts could be perceived, and the boilers supplied ample steam with moderate firing. The speed of the splendid screw steam-ship, drawing 17 feet 7 inches forward, and 20 feet 4 inches aft, propelled by a powerful screw of 18 feet diameter, with a pitch of 20 feet 6 inches, was the astonishment of all the captains and crews of the numerous sailing vessels coming up the river with the tide, and Mr. Stuart, the pilot of the *Agamemnon*, had a most difficult task to steer clear of them when taking, as they thought they could cross her path in ample time, instead of which they had narrow escapes, and it was more owing to the excellent look-out of Mr. Bean, master of the *Fisgard*, and the care of the pilot, together with the admirable manner in which the engines could be stopped and set in motion, and the way in which she answered her helm, that her safe progress through so many vessels as were in the reaches below Gravesend was accomplished without the least accident.

On reaching the Nore, the *Agamemnon's* boilers got clear of the mud, in some degree, which had passed into them while working in the basin at Woolwich. She left the tugs several miles behind her, and the fast steam-packet *Dryad*, belonging to the Woolwich Company, was at that time upwards of a mile astern, being unable to keep up with her. The *City of Canterbury*, a fast boat, on her passage to Herne Bay, had great difficulty in keeping up with the *Agamemnon*; and although the former had her foresails up, the *Agamemnon* kept ahead in fine style for upwards of three miles, until the *City of Canterbury* turned eastward for Herne Bay. Between the Nore and Mouse Lights, the speed of the *Agamemnon* was tried by Massey's patent log for half an hour, and found to be 10 6-10 knots, against a strong head-wind, the engines making 58 revolutions, and the result was so satisfactory to Captain Sir Thomas Maitland and Mr. Lloyd that they congratulated Mr. Penn on the success of the trial, which exceeded their most sanguine expectations. This fine vessel arrived and cast anchor near the *Waterloo*, 120, flagship at Sheerness, at half-past 4 o'clock, and all the officers and crews of the vessels afloat came on deck to witness her surprising speed. The Admiral's yacht *Tri-*

ton came out to meet the *Agamemnon*, but was obliged to drop astern; although going at her utmost speed the *Agamemnon* passed her, and she did not get into Sheerness till some minutes afterwards. It is understood that no further trial of the *Agamemnon* is considered necessary until she is completely equipped and stored for sea. She is to mount a 10-inch gun on a traversing platform at her bows, and her other ninety guns will consist of long 32-pounders, of 56 cwt. each, and 32-pounders of 42 cwt., and she has ample room to work them with effect, should their services ever be required. Notwithstanding all the reports of the high performances of the *Napoleon* French screw steam-ship of the same class, and about the same size as the *Agamemnon*, but fitted with engines of 1,000 horse power, it is very questionable whether the *Agamemnon* will not in all respects equal her, although fitted with engines of comparatively much less nominal power, which do not occupy one half the space, and probably do not weigh one-third of the *Napoleon's*.

NEW MODE OF LAYING DOWN TELEGRAPHIC WIRES IN STREETS.

The British Electric Telegraph Company have nearly completed, and are about to open, a considerable length of wire uniting some of the most important northern towns of the kingdom. This chain of towns includes Liverpool, Manchester, Halifax, Bradford, Wakefield, Barnsley, Leeds, Harrogate, and Stockton-upon-Tees, with some other of the intermediate places. The people of Liverpool and Manchester were rather agreeably struck with the rapidity with which this Company succeeded in laying down their wires in the streets, to complete the connection between the railway stations and the Company's offices. There is no greater annoyance in large towns than that which Parliament has granted to private companies of ripping up their pavements at all times and places where it may be necessary for their interests. The authorities of a town pave the streets at great expense, and then comes a gas company, and then a water company, and then a telegraph company, to open deep trenches in some of the leading thoroughfares, interrupting the traffic and creating great inconvenience. We have seen these trenches open in some cases six or eight days; but in the present instances we are glad to perceive that a great improvement has been introduced. Mr. Charles Bright, the manager of the British Electric Telegraph Company, we were informed, had the merit of inventing a new mode of laying down wires in the streets, which goes far to remove the objections we have pointed out. The method adopted by the old company has been to lay down a line of round cast metal pipes through which the insulatep wires are passed. This is necessarily a long and tedious operation, because considerable time is occupied, as each length of pipe is laid down, in passing the wires through it; but Mr. Charles Bright's plan is to use pipes split longitudinally into two halves. The under halves of the pipes are laid down in the trench, and then a large drum, on which the insulated wires are wrapped, is rolled along over the trench, and the wire is payed off easily and rapidly into its place—the upper parts of the pipes being put on afterwards, and secured in their places by means of screws through flanges left outside for the purpose. So well has this mode succeeded, that in Liverpool the whole lengths of the streets, from Tithebarn Railway station to the British Telegraph Company's offices, in Exchange-street East, were laid down in a single night (11 hours), and in Manchester, the line of streets from the Salford Railway Station to Ducie-street, Exchange, in 22 hours. This was the whole time occupied in opening the trenches, laying down the telegraph wires, and relaying the pavement; and while great credit is due to the Company, on the ground of the little public inconvenience occasioned, no doubt they would find the benefit of it in economy of time and money. The Company, it is expected, will be in a condition to open business now in about three weeks, having only to complete a short link between Wakefield and Leeds to make the line complete from Liverpool as far as Stockton. The Magnetic Telegraph Company have their line at work between Manchester and Liverpool, and are said to be making progress with their extensions towards the metropolis.

THE GREAT INDUSTRIAL EXHIBITION OF 1853 (DUBLIN).

Mr. Dargan, finding by the estimate of the preparatory Expenses of the Exhibition, recently submitted to the General Committee, that it will require a larger sum than was originally expected, to realise a complete and effective collection both of British and Foreign Articles, has just added 6,000*l.* to his original gift; thus making a total sum of 26,000*l.* that he has placed at the disposal of the Committee, for the purposes of the Exhibition.

PATENT LAW OF THE UNITED STATES APPLIED TO ENGLISHMEN.

(From the *Scientific American.*)

A correspondent of the London *Mechanics Magazine*, signing himself "Justice," calls attention to our present Patent Laws, and the large fees which the subjects of Queen Victoria have to pay for an American patent. All foreigners (Frenchmen, Germans, &c.,) are charged 300 dollars, Englishmen and all other British subjects are charged 500 dollars. This fee was charged to correspond with the Patent Fees of specific foreign countries. "Justice" hopes that our charge for Britishers will now be reduced, as the English Patent Fee has been lowered. We advocate its reduction to 300 dollars, so as to make all foreigners stand on the same level; but, at the same time, we do not advocate this measure because England has reduced her fees,—they are yet too high.

We do England the justice, however, to say that she makes no distinction between her own and American citizens—all men stand on the very same level before her Patent Laws. We hope our next Congress will reduce our Patent Fees, for the subjects of Britain, to 300 dollars. [We shall hardly be content with so small a reduction. We ought to be on the same footing as the Americans themselves. ED. M. M.]

PATENT LAW AMENDMENT ACT, 1852.—SECOND SERIES OF RULES AND INSTRUCTIONS.

Rules and Instructions to be observed in Applications respecting Patents for Inventions, and by Persons petitioning for Letters Patent for Inventions, and for Liberty to enter Disclaimers and Alterations.

The Law-officers of the Crown wish to discountenance the prevalent practice of introducing several distinct and separate Inventions into the same Patent; at the same time they will not refuse to grant a Patent where one invention is applicable to the improvement of several manufactures, or where several Inventions are applicable to the improvement of one and the same manufacture.

In the Petition for a Patent, the Title ought to state as distinctly as possible the extent and object of the Invention, without disclosing the mode in which it is performed, or revealing its peculiar character.

It is therefore directed that the following *Rules* shall be followed, as nearly as may be, except in cases in which the Law-officer may think that the strictness required cannot be observed without prejudice to the Petitioners.

1st. When a Petition for a Patent is left at the office of one of the Law-officers of the Crown, his attention must be particularly called to the *Title and Provisional Specification;* and if he be satisfied with their propriety and correctness, a Certificate will be given to the Petitioner, or his Agent, in the following form:

PATENT LAW AMENDMENT ACT, 1852.

This is to certify that the Petition, Declaration, and Provisional Specification of in the County of for the Invention of left and recorded in the Office of the Commissioners of Patents for Inventions on the day of 185 having been referred to me, and I being satisfied that the Provisional Specification describes the nature of the Invention, have allowed the same

Dated this day of 185

(Signed by the Law-officer).

If any impropriety or incorrectness shall appear to the Law-officer to exist in the Title, or in the Provisional Specification, he will require the Petitioner, or his Agent, to appear before him, for the purpose of satisfying him that he ought to permit the Title and the Provisional Specification to pass in their present form.

If the impropriety and incorrectness in the Title or the Specification are of such a nature as to require material alteration to an extent which in the judgment of the Law-officer ought not properly and reasonably to have been required, no Certificate will be granted; but should the Title and Provisional Specification, although defective, appear to the Law-officer to have been drawn up honestly and fairly, the requisite alterations will be allowed to be made.

2nd. When the Inventions are applicable to known manufactures, or to known machines, the Titles of Patents must state the manufactures or the machines; and, where it can conveniently be done, the part thereof to which the Inventions relates.

3rd. When a manufacture is carried on by several distinct processes, branches, or machines, the Title of the Patent must state to which of the processes, branches, or machines the Invention relates.

4th. If the Invention relates to an engine for producing power to be worked by mechanical means, or by water, steam, air, or gases, galvanic or other fluid, the *Title* must state which of the means is to be used.

5th. If the Invention relates to some process to be performed on known fabrics or manufactures, the process and manufacture must be stated in the Title.

6th. If the Invention relates to the appli-

cation of known materials to new purposes, or to the improvement of old manufactures, the Title must state the purpose or manufacture, and may state that it is to be improved by a new application of known materials.

7th. No Summons shall be issued, unless by consent or to suit the convenience of the Law-officer, appointing a hearing early than Seven days from the date of such Summons.

8th. The time allowed for Specification of any Invention shall be Six months from the date of the Petition being left and recorded in the Office of the Commissioners of Patents for Inventions.

9th. In the event of the Law-officer refusing to grant a Petitioner his Certificate at any hearing in consequence of a successful opposition being made, the Petitioner shall not be entitled to any further hearing, unless he shall first pay all costs of himself and of the opposing party occasioned by such further hearing.

10th. No person shall be permitted to examine, or shall be made acquainted with, the contents of a Provisional Specification, other than a scientific or other person called to the aid of a Law-officer, under the provision of the Statute.

In regard to *Provisional Specifications.*

11. The Law-officers will require that a Provisional Specification shall state the nature of the Invention, so as to distinguish it from what is already known, in order that the extent of the Invention may be clearly understood. They will not, however, require the Petitioner to enter into a description of the manner in which the Invention is to be performed.

The object of a Provisional Specification is to provide against the introduction into the Complete Specification of any matters of Invention differing from those for which the Letters Patent are granted. It is not intended in any way to prevent the Patentee including in his Complete Specification those improvements in practical details which may occur in carrying out his Invention, provided that those improvements require the use of the original matter of Invention which is set forth in the Provisional Specification for which the Patent is granted.

12. The Petitioner may apply to the Law-officer to amend his Provisional Specification, and if on hearing the party it appear reasonable that the desired amendment should be made it will be allowed. The Law-officer will not permit any new matter of Invention to be added, but will allow any part of the Invention which the Petitioner may, on consideration, desire not to introduce into his Complete Specification to be struck out.

13th. A Copy of the Provisional Specification, as allowed by the Law-officer, shall be introduced into the Complete Specification, in order to show more fully than the Title in the Patent the nature of the Invention for which the Patent was granted.

In order to obtain leave to enter a *Disclaimer* or *Alteration* of any part either of the *Title* of a *Patent*, or of the *Invention* or *Specification*, pursuant to the Statues,

It is directed—

14th. That the person applying (if the Patent be dated before the 1st of October, 1852), shall present a Petition to one of the Law-officers, stating what Disclaimer or Alteration is proposed, when a time will be appointed for hearing the Applicant. The Petition must in general be accompanied by a Copy of the Original Specification and the proposed Disclaimer or Alteration. If the Patent be dated after the 1st October, 1852, the Petition and other documents must be lodged at the Office of the Commissioners of Patents for Inventions.

15th. If on the hearing the Law-officer disallow the proposed Alteration or Disclaimer, no further proceeding will be necessary. If he allow it without advertisement, on being applied to for the purpose, he will put his signature to the Fiat authorising the Clerk of the Patents to make the required entry.

16th. If it appear to the Law-officer that any advertisement, or advertisements, ought to be inserted, he will give such directions as he may think fit relative thereto, and will fix any time, not sooner than Ten days from the first publication of any such advertisement, for resuming the consideration of the matter.

17th. With regard to Patents passed before the 1st of October, 1852, Caveats may be lodged at the Offices of the Law-officers at any time before the actual issuing of the Fiat; and any party lodging a Caveat must have notice of the next Meeting, if any be previously appointed; but if the Meeting be not appointed before entering the Caveat, the party lodging it must have not less than Seven days notice of such Meeting.

(Signed.) FREDERICK THESIGER.
FITZROY KELLY.

Temple.

(We give the above Rules as issued by the Law-officers, but understand they are to be considerably modified, which will also be the case with the previous Series, and which we printed *ante*, page 235.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING OCTOBER 7, 1852.

JOHN MACINTOSH, of Berners-street, civil engineer. *For certain improvements*

in ordnance and fire-arms, and in balls and shells. Patent dated March 24, 1852.

1. Mr. Macintosh proposes to effect the discharge of a succession of balls from guns or fire-arms in the following manner:—He uses six or any required number of hollow conical balls, having a charge of powder in the interior, and a hole pierced through the apex into the powder chamber, in which hole is placed a fuse or some explosive composition. He then envelopes the balls in a paper case, placing them so that the charges in each shall be in communication through the medium of the fuses, and introduces the compound cartridge thus formed into the barrel of a gun constructed for the purpose with a supplementary touch-hole and hammer at a distance from the breech corresponding to the length of compound cartridge used. A small quantity of powder is introduced into the gun-barrel after the compound cartridge, together with a wad. On this charge being fired by the supplementary lock, it ignites the powder in the first ball, and causes it to be projected; the discharge of this is communicated to that in the second ball through the fuse or composition in the head of that ball, and so on throughout the series. The interval between the discharges may be regulated by the nature of the fuses or explosive mixture used.

2. It is proposed to construct shells of an elongated or spherical form, with thin cases and a core of metal through the centre, around which the explosive mixture is filled in. This causes the shell to burst on all sides, instead of forward or backward. When firing spherical shells, the patentee used a peculiarly-shaped wad, by which the windage is reduced, and which, on being discharged, expands so as to fill the bore of the gun or mortar.

3. To enable guns to be fired under the water-line of ships, the patentee provides ports at any required depth of immersion, which he closes with two flaps of vulcanized India-rubber, the elasticity of which keeps them in constant contact. There is a wooden slide inside, and the port is lined all round with a thick ring or block of vulcanized India-rubber. When the port is required for use, the slide is removed, and a gun having been run close up to the port with its muzzle in contact with the India-rubber blocks, it is fired in that position. The India-rubber flaps admit of the ball passing between them, but close immediately after, and prevent the ingress of water.

Claims.—1. The improvements in firing a succession of balls from guns or fire arms.

2. The mode of constructing balls or shells to ensure their exploding on all sides, and not forward or backward.

3. The mode of constructing or arranging parts in connection with guns to facilitate their being fired under the water-line of gun-boats and vessels.

William Henry Hulsebeeg, of Mile-end. *For certain improvements in the treatment of wool, hair, feathers, fur, and other fibrous substances, and in machinery or apparatus for the same.* Patent dated March 24, 1852.

The *first* part of this invention consists of a method of purifying wool, fur, hair of various kinds, and feathers; and the *second* part has relation to machinery for carding and separating curled hair, cocoa-nut fibre, &c.

When new horse-hair, hogs'-hair, and cattle-tail hair are operated on, the patentee first washes them in a bath of warm water, using soft soap and a small quantity of potash for the purpose of cleaning them as much as possible before submitting them to the second part of the process, which consists in immersing them in a bath of lime-water. They are then transferred to a close chamber, having numerous perforated shelves or trays, on which the materials are placed. A stream of chlorine, which may be produced by heating peroxide of manganese with muriatic acid or sulphuric acid and salt in a suitable retort connected with the close chamber, is then caused to pass through the materials by which they will be completely disinfected and purified. The chlorine is afterwards removed by the application of solution of ammonia, which unites with and carries it off in the form of thick white fumes.

When old fur, hair, or feathers are operated, the materials are not steeped in the lime-bath, but are sprinkled with dry lime, and then submitted to the action of chlorine, as before described.

The machinery for carding curled hair consists of a drum or skeleton frame, on which are mounted comb-carriers with card-teeth set in a bed of elastic material. The combing drum revolves in a semicircular wire-gauze trough, and above it are placed other comb-carriers, with similar card-teeth mounted, as above described, in a bed of elastic material, and provided with springs to allow for a certain amount of lateral play. At one side of the machine is an endless feeding sheet for supplying the material to the feed rollers, which deliver it to the combs, and which are mounted in spring-pressure bearings; and at the other side is a brush for stripping the carded hair from the combs. The materials, being fed in by the endless sheet and feed rollers, are caught by the card-teeth on the revolving drum, and drawn under the upper card-teeth, by the combined action of which they are opened out and brought to a fit state for use.

Claims.—1. The purifying of new horse-hair, cattle-hair, hogs'-hair, feathers, wool, or other fibrous substances, by the employment of a lime-bath and chlorine gas, by which all impurities and infectious matters contained therein are removed, and all moth or animal life destroyed.

2. The purifying of old hair, feathers, fur, &c., as above described.

3. The adaptation of moveable teeth to the revolving cylinder of machinery for carding hair, cocoa-nut fibre, and other similar fibrous substances.

4. Mounting the teeth in a bed of flexible material.

5. Regulating the upper comb-carriers by means of springs, for the purpose of admitting of lateral play.

6. The use of spring-pressure bearings to the feed rollers.

William Pidding, of the Strand, gentleman. *For improvements in the construction of vehicles used on railways or on common roads.* Patent dated March 24, 1852.

Amongst the most noticeable of these improvements are—

1. A mode of constructing carriage wheels with flexible spokes composed of whalebone, spring steel, &c., and with divided tires. The several portions of tire are covered with a flexible material.

2. The application of catches to the spokes of carriage wheels constructed as above, for the purpose of combining or centralizing the power of any number of such spokes.

3. The use of friction-roller bearings for axles, by which the necessity for the employment of lubricating materials is dispensed with. The friction rollers are supported in a circle of radially-formed pieces of metal and India-rubber placed alternately, and encircled by a band of India-rubber, which maintains a constant tendency to contract and bind the circle of radial pieces close together and upon the friction rollers.

4. A mode of mounting the elastic-spoked and divided tire wheels on axles of unequal length, by which they may be brought close together, and one pair made to overlap or project beyond the other pair.

5. Two modes for employing portable rails to be laid down by a carriage as it advances.

6. The construction of the panels, mouldings, &c., of railway carriages of materials partaking of the nature of papier maché, such as straw, &c., suitably prepared, or of fecula, alone or combined with materials such as before mentioned.

Richard Parris, of Long Acre, modeller. *For improvements in machinery or apparatus for cutting and shaping cork.* Patent dated March 24, 1852.

Mr. Parris's machine consists of a large circular toothed or serrated cutter, mounted horizontally in a suitable frame with a series of holders round the same, which receive the pieces of cork to be cut or shaped from the feeding apparatuses, and hold them while every part thereof is presented to the action of the circular cutter, which has a continuous rotary motion in the frame. By regulating the motion of the holders in relation to the circular cutter, any required tapering form may be given to the corks which are undergoing the operation of cutting. In some cases, and particularly where the machine is required to be of small size only, the principal cutter may be mounted in a vertical position; and in this case, of course, the position of the holders must be varied to suit the particular position of the cutters.

Claims—1. The combination of parts of machinery forming a machine or apparatus for cutting and shaping cork.

2. The use of cutters placed vertically for cutting and shaping cork, in so far as regards the holders and particular position of the cutter.

3. The employment of toothed or rough-edged cutters for the purpose of cutting and shaping cork.

4. The use of holders, by which the pieces of cork to be cut or shaped are held while the cutters perform the operation of cutting.

Antoine Maurice Tardy de Montravel, of Paris, gentleman. *For certain improvements in obtaining motive power and the machinery employed therein.* Patent dated March 24, 1852.

This invention consists in obtaining motive power from atmospheric air or other gas compressed in a cylinder or suitable vessel, by the application alternately of heat and cold to the same, whereby the air or gas is alternately expanded and condensed, and a reciprocating motion thus produced on a piston moving inside the cylinder, which reciprocating motion may be caused to actuate a crank or other means of applying the power obtained. To make the piston more effectually air-tight, it is packed, so to speak, with fluids such as water, or semifluid matters such as grease, &c.

Claims,—1. The system or mode of obtaining motive power by the alternate application of heat and cold to atmospheric air or other gases permanently enclosed in a cylinder or other suitable vessel.

2. The use and application of liquid or semifluid matters between the atmospheric air and the piston.

3. The various arrangements of machinery or apparatus described.

William Archer, of Hampton-court, gentleman. *For an improved mode or modes*

of preventing accidents on railways. Patent dated March 24, 1852.

In order to prevent railway accidents from one train following too rapidly after another, Mr. Archer proposes to establish signal-posts at any convenient distance from each other on the line of rails, and to fit to the rails in the immediate locality of these signal-posts an arrangement whereby the passage of a train may, by its pressure or weight, be caused to set or exhibit instantaneously some signal, which, as soon as the train has passed, is, by the aid of supplementary contrivances, returned to its normal position, but at a very much slower rate than it was originally moved at, and the time thus occupied in the return or "unsetting" of the signal may be regulated to any required extent, so as to give notice to the engineer of a train of the time that has elapsed since the passage of the train immediately preceding. The arrangements by which these objects are effected constitute the subect-matter of the claims, which are—

1. The setting of signals or alarms by the pressure or gravity of a locomotive engine, carriage, or other vehicle in a state of motion passing along a permanent way of any kind, the said pressure or gravity being used in lieu of manual labour or other power. (This claim is considerably too wide—railway signals having been previously actuated by the passage of a train.)

2. The improved inclined vane and friction wheel, by each or both of which the power derived from the gravity of the moving body is transmitted to the several other parts of the apparatus.

3. The air receiver admitting of a diminution or increase of its cubical contents.

4. The combination of bent levers, counterweight, catches, wire chain, or other connecting medium in connection with the inclined vane or friction wheel, for communicating the settings or unsettings of the signals or alarums to a greater or lesser distance.

JOHN WHITE and ROBERT WHITE, of Cowes, in the Isle of Wight, ship-builders. *For improvements in ship-building.* Patent dated March 24, 1852.

For specification, see *ante*, page 290.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of 166, Fleet-street, London, patent agents, for improvements in knitting machinery. (Being a communication) October 7; six months.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of 166, Fleet-street, London, patent agents, for improvements in the manufacture of sugar, and in the machinery and apparatus employed therein. (Being a communication.) October 7; six months.

Alexander Shairp, of the Patent Office, 166, Fleet-street, London, for an improved cutting and slicing machine. (Being a communication.) October 7; six months.

John Reed Randell, of Newlyn East, Cornwall, farmer, for improvements in cutting and reaping machines. October 7; six months.

Pierre Armand Lecomte de Fontainemoreau, of South-street, Finsbury, for certain improvements in washing, bleaching, and dyeing flax and hemp, and in mixing them with other textile substances. (Being a communication.) October 7; six months.

Solomon Andrews, of Perth Amboy, in the United States of America, engineer, for improvements in machinery for cutting, punching, stamping, forging, and bending metals and other substances, which are also applicable to the driving of piles and other similar purposes, and to crushing and pulverising ores, and other hard substances. October 7; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Oct. 2	3378	Henry Stanbrough, Esq.,	Nutford-place, Edgeware-road	Invalid table.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

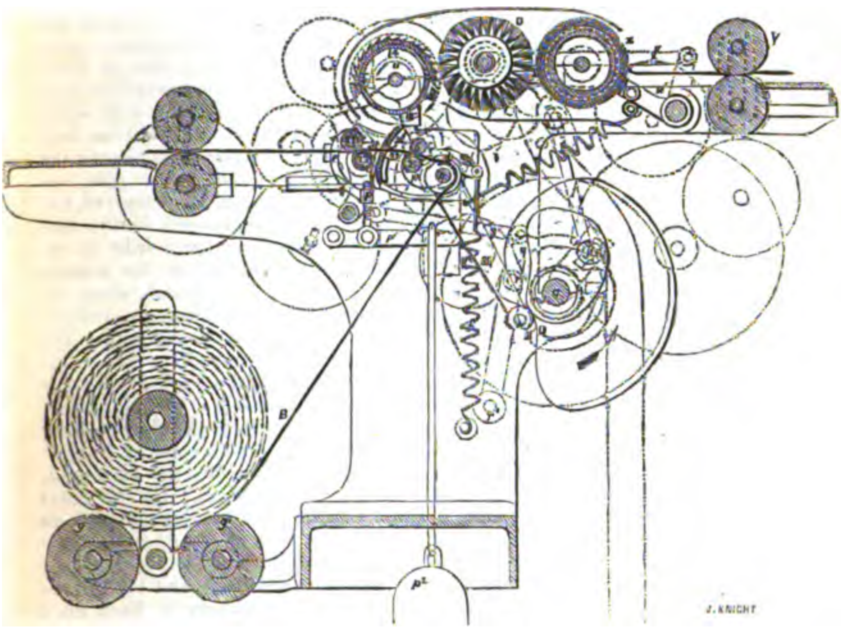
MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 1523.] SATURDAY, OCTOBER 16, 1852. [Price 3*d.*, Stamped 4*d.*

Edited by R. A. Brooman, 166, Fleet-street.

BOURCART'S PATENT MACHINERY FOR PREPARING, COMBING, AND SPINNING WOOL.

Fig. 1ᵃ.



[Fig. 4ᵃ.

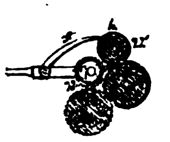


Fig. 3ᵃ.

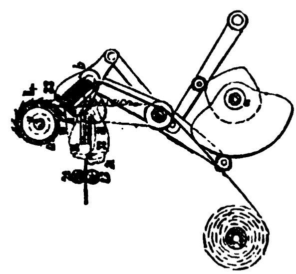


Fig. 6ᵃ.

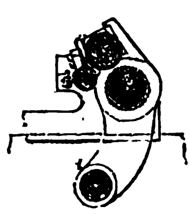
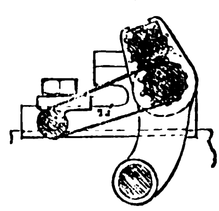


Fig. 5ᵃ.



BOURCART'S PATENT MACHINERY FOR PREPARING, COMBING, AND SPINNING WOOL.

(Patent dated March 27, 1852. Specification enrolled September 27, 1852. See *post* p. 316.)

The specification of M. Bourcart's patent embraces a variety of objects of considerable importance in the several processes to which the title applies, and the ingenuity and simplicity of his mechanical arrangements are such as to promise their extensive adoption. We propose to give a brief account of the more prominent portions of this invention referred to in the accompanying diagrams, pointing out, in passing, the particular nature of the improvements which the invention has effected. These are reducible to two general heads:—First, to improvements upon, and additions to, the invention patented in England by Josué Heilmann, of Mulhausen, France, on the 18th February, 1846; and, secondly, to improvements in machines for preparing and spinning wool and other fibrous materials, after being combed, or after the fibrous material has been carded or combed, or after it has been carded only, or otherwise rendered fit for spinning. The great improvement in the dressing-machine of Heilmann consists in increasing the number of "gills," or rows of teeth on the drawing-roller 8 (fig. 1), which the inventor has found to execute the work much better. To accomplish this object, he substitutes for the bars a wire, V, between each of the gills, to which motion, inwards and outwards, is imparted by their ends being made to work in eccentric grooves in the manner described by Heilmann. Figs. 2 and 3 represent a "balling" apparatus, which M. Bourcart uses in combination with this and other preparing machines, as carding-engines, drawing-frames, or combing-machines. The sliver is wound round the roller 8, which receives motion from the drum 12, and it is also made to pass round and through the finger, or guide, 11, before it is wound on the bobbin. By this arrangement a tension of the sliver is produced as near as possible to the "nipping" or point of contact between the finger and the bobbin 8, to which the reciprocating motion is given which is necessary for winding. Thus the tension obtained by friction is effected within a distance shorter than the length of the fibres to be wound, and the strain is sustained, not by the sliver, but only by the fibres. By this novel feature of the machinery, it is obviously possible to produce a hard bobbin with an untwisted sliver, and without injury to the latter. The form of the finger is exhibited in figs. 2 and 3. It consists of two bars *a*, provided at each end with a tube *bb'*, between which one, two, or more pins, *c c*, may be introduced, and set as near together as the nature of the fibres require. One end of the finger is fixed on a centre pin 10, which oscillates according to the varying size of the bobbin, and the other is kept constantly in contact with the bobbin by means of a spring or weight. As the sliver comes from the delivery roller, it passes through the first tube, then under and over the pins, and then through the second tube, which forms the surface contact with the receiving bobbin. In fig. 3 another figure is shown, the mode of action of which is similar. Another improvement in Heilmann's arrangement consists in the addition of one or more pairs of delivery-rollers, which may be advantageously substituted for the endless apron *k* (fig. 1), for the purpose of preventing lapping. M is a fluted roller, the flutes of which are pitched to work with the porcupine roller D, so as to force the sliver between the pins. Fig. 4 represents Heilmann's combing apparatus, which acts upon a lap, sliver, or "fleece," AB. This it breaks asunder, as shown at C, D, and then combs each end C, D, so as to separate the long from the short fibres; the long ones being twisted in one sliver by overlapping the ends C, D. The short ones are united in another sliver. The fleece AB is similarly operated upon in detached portions, and the long fibres are ready for drawing, roving, and other subsequent operations. M. Heilmann accomplishes this by nippers 33 and 34, shown in figs. 1ᵃ and 3ᵃ, the operation of feeding being stopped at intervals, while they take up the end of the fleece just delivered into the machine. A set of combs, 14, fixed on the drum 11, then operates upon it, and it is next seized by a pair of rollers, 22 and 23, which remove from the sliver all the fibres that have been taken hold of. The comb 31 retains the short fibres and other refuse in the front end of the sliver, which will be delivered and combed the next time, and pieced with those previously detached. Then the roller 23 passes against the part 13 of the drum 11, imparting motion to it; the lap of fibres is passed

back, and the end *c* presented to the combs 14 of the drum 11, to be again operated upon, so as to withdraw the "nips" and knots which may have passed through the combs 31. Thus the action of the machine is to detach small portions in succession to comb them, and piece them up again in a sliver, which is delivered.

Fig. 1.

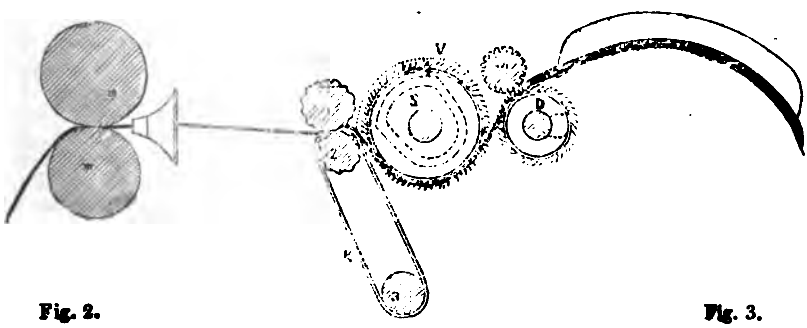


Fig. 2.

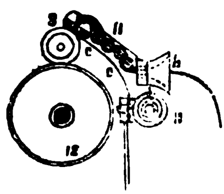


Fig. 3.

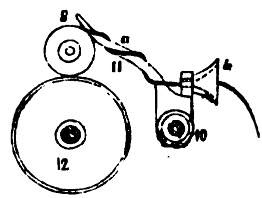


Fig. 5.

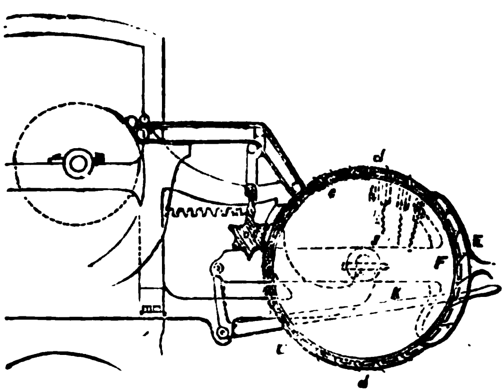
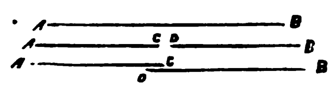


Fig. 4.



When long fibrous materials are being acted upon, M. Bourcart gives an additional oscillatory motion to the detaching rollers, 22 and 23, by means of eccentrics, or crank-shafts, which completes the detaching. In some circumstances, however, he prefers to keep these rollers fixed, imparting to them only a motion about their

axes, or to keep one of them at least fixed, and to effect the detachment by additional motion to Heilmann's Feeding Apparatus. The description of this arrangement occupies a considerable portion of the specification.

Fig. 7.

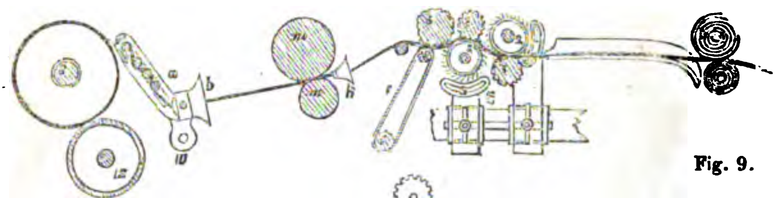


Fig. 9.

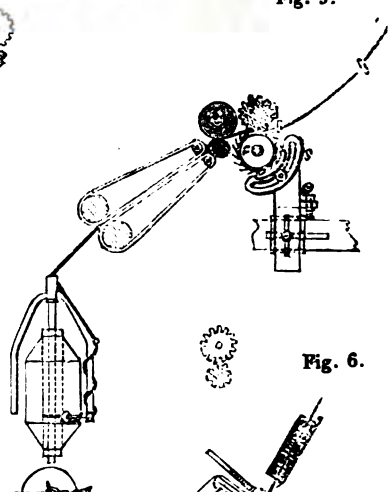


Fig. 8.

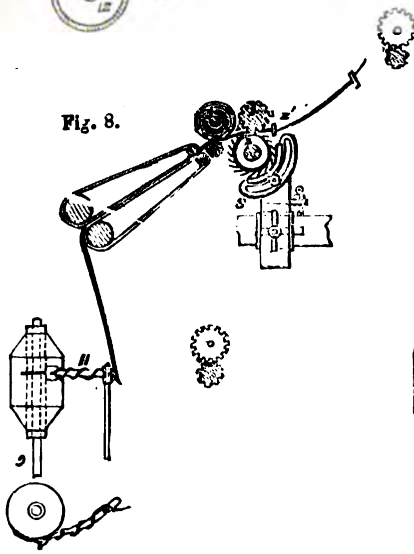


Fig. 6.

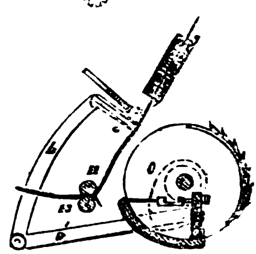
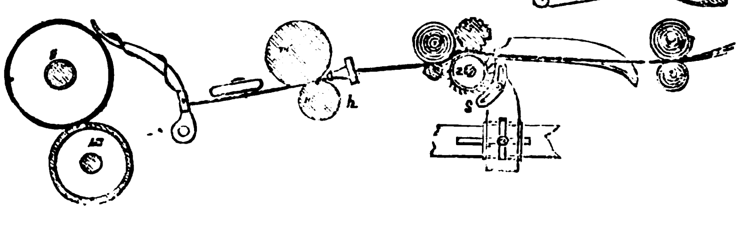


Fig. 10.



In fig. 1 comb 31 is shown, in its lowest position, just about to be forced into the combed front end of the fleece by the eccentric O, and then to follow the open nipper in its rising motion until the detaching is effected. The concentric part of the eccentric O then keeps the comb still, until the combing is completed and the nipper lowered again, when the comb 31 is also lowered, and brought into its first position, ready to be again forced into the fleece which has just been combed. Both rollers may be fluted, and driven by wheels, as shown in fig. 5, or one only may be fluted, and the other covered with leather, as in figs. 1 and 6. In figs. 6 and 4, 23′ is an ad-

ditional roller, made to revolve by direct frictional contact with the bottom roller 23, which the inventor has found useful to prevent lapping. M. Bourcart also proposes to substitute, either altogether or partially, a combination of brushes or bristles. Another improvement is the substitution of an additional roller in the place of the endless apron generally used, to prevent lapping of the sliver round the rollers. Fig. 5 represents an improvement which he proposes in Heilmann's combing-machine, and which consists in winding the sliver delivered by the machine on a pinned surface. He does not make a general claim on this point, but only in combination with Heilmann's Machine. Another improvement (shown at fig. 6), consists in adapting cutters, knives, or scissors to Heilmann's Machine, to cut or break those fibres which are not too long. The drawing process is performed by an apparatus to which figs. 7, 8, 9, and 10 refer. The dressing operation is effected by a fixed tube *h* and a pair of delivering rollers (as in fig. 7), through which the sliver is conducted. When the sliver is fine, however, a turning tube, instead of a fixed one (as shown in fig. 10), is recommended. The winding or balling process is performed by an apparatus very similar to that described in the previous operation of dressing. When the sliver becomes fine, the form of machine shown at fig. 9 should be employed.

These are the principal points of M. Bourcart's invention. We have endeavoured to condense its substance into short compass, and it would be well worthy of further description if the details were not so numerous, and the explanations which they would require so long. We trust, however, we have given enough of M. Bourcart's contrivances to enable them to be fully appreciated.

THE EXCISEMAN'S STAFF QUESTION.

[In giving insertion to the following letter from "Indagator," we have to express the hope that the talented correspondents who have contributed to the discussion of this subject will consent to forego any further recurrence to it which, in their opinions, may still be called for. The question has been discussed with great learning and mathematical elaboration by all of them, and we feel assured that our general readers will concur with us in thinking that every point of public importance involved in it has been amply developed.—ED. M. M.]

Sir,—The letter of "Mechanicus," in your last Number, induces me to take the earliest opportunity of expressing my regret that I should have given any countenance to Mr. Smith's tactics, by joining with him in the reprobation of supposed practices of certain "little cliques." Some expression in "Workman's" first letter seemed to give some colour to the supposition that there did exist such "a clique" in the present instance. I am delighted to be informed that such is not the fact, and am glad to make the *amende honorable* to Mr. Tebay and "Workman," if they feel aggrieved at all by any expression of mine. "Mechanicus" informs your readers that, with the exception of friction, the correct and corrected solutions of the Exciseman's Staff Question which have appeared in your Magazine, coincide in principle with that of Mr. Wolfenden. I have not had the pleasure of seeing his solution; but since it is in friction mainly that the principles of statics have made progress since his time, I am not surprised at the statement. So far from considering this a disparagement, I should have felt a want of coincidence with an acknowledged mathematician when working on the same recognized principles, as a good reason for reconsidering my solution.

Mr. Smith's last letter deserves, and shall receive like notice from me. I certainly shall not follow him through his "detailed explanation," in which he has the audacity of attributing to philosophers (Coulomb, Morin, Moseley, and others), opinions which would fairly astonish them. Nor should I pay him the compliment of making even a passing allusion to his uncouth efforts, but that it gives me an opportunity of correcting an error with respect to friction which he entertains, and which some of your readers may perhaps share with him. And here I must take leave to remind our irate sage that, while he takes such pains to parade his ignorance or misconception of first mechanical principles before the eyes of the public, he has no

right to be offended at the efforts which are made to improve his knowledge. There is something very amusing in his efforts to shield himself behind the buckler of "Moseley, Hann, Tate, Gordon, and other sound authors of earlier date."

But a man of his experience ought to know (if he will excuse the *savoury* proverb) that "the proof of the pudding lies in the eating,"—that it is not every-one who is in the "daily habit of consulting" such authorities that penetrate their meaning. Of this the "Wexford sage" is a striking example. If the application of mechanical science to the useful purposes of life which result from his closeting with his chosen infallible guides be of the same nature with his solutions of the Exciseman's Staff Question, all I can say is, I am glad that I am not the person to "*profit*" by them.

The Wexford oracle says, "The extraordinary mistake to which I referred, and which still appears to me unaccountable, is this: that such continuous efforts should be made to prove that the inclination of the cylinder, or its *angle of position*, at the time of observation, must have been equal to the angle of friction; whereas it may have been in *any position* from the horizontal to that angle of inclination at which it was about to slip, within which range the friction of slipping does not apply."

As regards these "continuous efforts," in which I have shown Mr. Smith *inadvertently* took his part, when the proper solution of mechanical equations conducts to a definite result, as in this case, we cannot change that result, which (with our sage's leave be it spoken) would be unphilosophical, but can only pretend to interpret it. Now what I affirm in accordance with this result is, that if the staff be placed at any angle to the horizon between zero and the *limiting* angle of resistance, *consistently with the maintenance of the equation of moments*, the rod will rest in that position. This I pointed out, as I thought, clearly enough in my solution in No. 1517. In the horizontal position there would be no friction; at every inclination between this and the limiting angle of resistance, there would be a *tendency to slip*, which would be counteracted by the amount of *friction* called into play, ranging between zero and its value in the limiting position.

Hence ϕ, the angle at which the pressure on the staff is inclined to the normal, is capable of all values between zero and the limiting angle of resistance, so that its tangent be equal to the ratio of the amount of friction called in to the play to the *normal* pressure. Mr. Smith, apparently, is not aware that the force of friction is of such a nature that the *amount* of it called into action depends on the amount of tendency there is in the body to slip, and that it may therefore take all values between zero and its greatest amount relative to the normal pressure.

As a matter of fact, the weight of the exciseman's staff in any particular case is never *indeterminate*; for, as we have seen from the solution, the *angle* of its inclination to the horizon is always equal to the angle whose tangent is the ratio of the friction to the normal pressure. There can only be *one* such position consistently with the equation of moments; there may, therefore, be a greater or less tendency of the rod to slip in any particular case. But if the *angle* at which the rod is inclined be observed, or (which amounts to the same thing) if the length of the portion of the axis of the staff immersed, and the depth of the surface of the fluid below the point of support, be observed, there is one, and but one value of which the weight of the staff is capable. The only *indeterminateness* in the problem in such case is this: that, with the same depth of the fluid below the edge of the barrel, there may be several staffs of different weights which would rest in equilibrium in the manner supposed in the problem; but every one of these would rest at a different angle to the horizon, would have a different amount of tendency to slip, and would have a different portion of its axis immersed. It is for the sake of placing this matter clearly before your readers, and not with a view of answering the Wexford philosopher, that I trouble you with this letter.

As for poetry, to which I never made any claim, if, as is sometimes said, poetry is fiction, Mr. Smith has usurped the lion's share of that element in the present discussion, and I know nothing but a metrical version of his solution, and his "arguments" to make them perfect as

a specimen of art of this kind. I will not disturb the sage in his enjoyment of his "*Io triumphe*" at my retreat, and the choice rhymes in which he celebrates it. Much good may it do him! If it tend to keep him in a good humour, and dispose him to listen to the mechanical *lessons* which he has received from so many quarters, it will not have been without its use, and I, for one, shall rejoice that so admirable an expedient for making learning palateable has been found, in accordance with the recommendation of old Horace:

"Ut pueris olim dant crustula blandi
Doctores, elementa velint ut discere prima."

I am, Sir, yours, &c.,
INDAGATOR.

WEBSTER'S NEW PATENT LAW. PUBLISHED BY F. ELSWORTH.

This is an admirably condensed and comprehensive manual of the practice under the new Patent Law, accompanied with a succinct account of its history and objects. Whilst this subject is undergoing a complete revolution by the operation of successive legislative enactments, and the increased development of inventive genius in this country, we cannot conceive that any more valuable aid could have been conferred upon the important class of individuals to whom it addresses itself. Undoubtedly, in the present state of circumstances which surrounds them, there is abundant occasion for the guidance which can alone be afforded by one to whose mind all the details of this extensive branch of our civil jurisprudence have long been familiar. Beset as the inventor is by unseen difficulties, and liable to be betrayed into useless expense by an error of judgment, however pardonable, he cannot but feel the need of a skilful pilot to assist him in the perfect accomplishment of his wishes. The author of the little book before us is pre-eminently qualified for the task he has undertaken, from a long course of experience in the sinuosities of the Patent Laws, to which he has almost exclusively devoted himself, and from the knowledge which his ample practice has afforded him of the requirements of inventors in the prosecution of their claims. His exposition of the law will be found accordingly to possess every feature that could recommend it—conciseness, clearness, the omission of nothing that is necessary to be observed, and the statement of every material point. In the historical sketch by which his digest of the law is introduced, he bears his testimony to the extremely unsatisfactory state in which it has for so long a time remained, and which, thanks to the impulse which has come from the extension of the arts and manufactures, is now in course of being shaped to the new exigencies of the time. On this subject, in the very first page of his book, Mr. Webster has these observations, in which it is unnecessary to say we fully concur:

No language can convey any adequate idea of the general dissatisfaction and distrust which existed in reference to this subject amongst men of science, persons holding or having held the highest judicial situations, law-officers, and every class of professional men. It has been represented that patent agents, a class of professional men more immediately engaged in obtaining patents, in preparing specifications, and in advising on inventions generally, were opposed to reform in the patent system. Mr. Wyatt, the editor of the *Repertory*, Mr. Newton, the editor of *The London Journal of Arts and Sciences*, and Mr. Robertson, the projector and editor of the *Mechanics' Magazine*, have written and given evidence against the system during the last quarter of a century. The testimony of Mr. Newton and Mr. Robertson, the two oldest and most successful patent-agents now in practice, is supported and added to by almost every other patent-agent, who, from actual experience, speaks of the system as exhibiting "dodging" (482), "all sorts of manœuvres understood by racing" (864), "giving advantage to an unscrupulous over a scrupulous agent, and presenting a sort of strife degrading to be connected with" (886); as affording no security, and as bad as horse jockeying (211) — (See evidence before Select Committee of House of Lords, 1835, on Patent and Designs Bills.)

It is only necessary to observe further, that in addition to the practice under the Amendment Act of last Session, the book sets forth that under the Protection of Inventions' Act, and that it gives the rules of the Commissioners of Patents, and all the practical forms and proceedings.

LARDNER'S HAND-BOOK OF NATURAL PHILOSOPHY AND ASTRONOMY.*

The title of this book fairly describes its character and object; its predecessor with the same name, dealt with mechanics, hydrostatics, hydraulics, pneumatics, sound, and optics; its successor is to complete the series with astronomy and meteorology. As a "Hand Book," it makes no pretensions to originality of research or novelty of results. Its purpose is the useful one of placing in the hands of those who are beginning to learn, or of those who need information not of the profoundest kind, the elements and chief details of the sciences enumerated in the title-page. The highest praise to which such a work aspires is that of clearness of plan, due proportion of parts, fidelity of statement, and completeness of execution. To this praise we think the volume fairly entitled; and indeed the pen of Dr. Lardner, so long and so often practised in compilations of this kind, could hardly produce an inferior book. We presume the chief labour of the writer has been that of bringing up his details to the date of the latest discoveries; and it is only fair to say, that there is little, if any thing, in the recent advances of science which has not here its sufficient exposition.

In restricting the credit of this volume to that of judicious compilation, we are not underrating the talent requisite for its production. It is comparatively easy for a man of scissors and paste to snip out from standard books the odd sentences which strike him most, and string them together with crudities of his own. Many a book has been made after this fashion, and its author 'has thought, most mistakenly, that he has given to the world an epitome of science. The facility of his task arose from his own ignorance of the subject: had he duly understood it, he would have seen the difficulty of giving a fair view of the whole within the necessary moderation of compass, yet without omission of essential details or obscurity of fundamental principles. To know what may be omitted without harm to the completeness of the reader's general idea, what may be briefly expressed without danger of erroneous inference, and what may be explained at length without risk of giving it undue prominence in the entire marshalling of facts, can only come of intimate knowledge of the whole subject and a practised facility in the exhibition of its parts. The further, too, that a science has advanced from its original principles, and the more it has accumulated of complicated consequences and applied results, the more does it demand of those qualifications in every one who professes to systematize its stores, and to exhibit them to the easy apprehension of unaccustomed minds. The art of compilation becomes in time almost as important as a knowledge of the subject matter; and he who is thoroughly engaged in the profundities of science, or at the advanced posts of its discoveries, may be just as incapable of producing a useful abstract of the whole, as he who knows nothing more of it than he happens to read for the immediate purposes of his next epitome.

For the duties of a compiler of books of science, perhaps few men are better qualified than Dr. Lardner; and the blemishes we may see in his present volume would not justify us in refusing to allow it to be worthy of his qualifications. Here and there is a sentence which, under the needful process of compression, has come to be too general in its terms for the reader to suppose that limitations and exceptions have yet to be looked for: but the fault, a difficult one to be avoided in such a book, is commonly mitigated by the context; so that, if the reader be not an extreme specimen of the hasty class for which the volume is partly designed, he will obtain, with moderate attention, from a few paragraphs or pages, a fair and just idea of the subject.

Compilations, if just to their purpose, necessarily include much old matter; and we here recognize old friends, principally Tables, which have done duty in similar musters for many years past. They are, however, fairly and pretty fully given, which is not always the case, and they are duly supplemented with whatever is required to bring them up to the advanced knowledge of the day.

* Hand Book of Natural Philosophy and Astronomy; by Dionysius Lardner, D.C.L. Second Course. Heat—Common Electricity—Magnetism—Voltaic Electricity.
Taylor, Walton and Maberly, London, 1852. 12mo. pp. 456.

Leaving now the merits of this particular book, it is worth while to note the characteristics of two different classes of compendiums. Of the first of these we take the volume under review to be one of the best examples: of the second, for an eminent instance we select "Morin's Aide-Memoire de Mecanique Pratique." The first class gives us science alone, with little or nothing of the means and methods of practical application: the second gives the concrete results of investigation and experience, ready made up for use, but with little or no intimation of the ultimate natural facts on which they depend, or the principles by which they are connected with each other. One by itself is too abstract for use; the other by itself is too material for thought. A man may read the first and think he fully understands it, and yet find himself amazed at the operations of a cotton-mill, and utterly without a place, as he is without self-reliance, when any thing is actually to be done; he knows not what to do with his knowledge. The other may be read and advantageously used as far as it goes; but, in respect of its reader, it is wholly empirical: and he who may feel by practice tolerably safe within the cases which it has foreseen for him, either dares not to tread beyond its boundary, or soon finds himself in a maze of errors. Neither of them alone affords him a safe and familiar grasp of principles and their application, nor, consequently, any just self-confidence under new circumstances and unforeseen emergencies.

Perhaps we cannot better illustrate, in small space, the difference between these two classes of books, than by comparing the two following Tables, one from Dr. Lardner's book, the other from M. Morin's. The comparison is an extreme one, it is true, and would be unfair to Dr. Lardner's book if taken as an average sample of it. Since, however, these are the two which the most nearly relate to the same subject in its different stages and forms, we use them for our purpose, subject to the caution just given.

From the present volume, then, pages 136, 137, we have the following:

"1594. *Table of the quantities of heat evolved in the combustion of various bodies.* In the following Table is given the heat developed in the combustion of the substances named in the first column; the thermal unit being the heat necessary to raise a weight of water equal to that of the combustible, one degree of the scale of Fahrenheit's thermometer."

Names of Substances.	Formulæ.	Quantity of heat given by 1° of combustion.
Hydrogen at 15°	....	62·031·6
Carbon from C to CO 2	....	14·544·7
Cetine.........................	C 32 H 32	19·941·3
Alcohol	HO 2 + C 4 H 4............	12·931·2
Essence of Turpentine	C 20 H 16.................	19·193·4

The Table is extended to nearly 60 articles, all more recondite than these; and this is all the information given in this volume of the quantity of heat evolved by the combustion of different substances. He who should need particular directions as to the quantity of heat, or of fuel, required for a particular object, would find nothing in this volume to his purpose, unless he knew how these highly abstract statements could be made available.

The parallel passage of Morin's book, translated and adapted to English measures, is as follows:—

"206. *Definition of a Unity of Heat.*—In order to compare quantities of heat amongst themselves, we take for unity the quantity of heat which will raise a pound of water one degree of Fahrenheit; and we name that unity a *calorie.*"

Next come numerical examples for illustration; and then,

"207. *Quantity of heat developed by divers combustibles.* The quantities of heat developed by a pound of different combustibles have been determined by means of the calorimeter of Lavoisier, and are given in the following Table."

Nature of Combustibles.	Quantity of heat developed in calories.	Remarks.
Charcoal, dry	3917	Of any kind.
„ ordinary	3333	Containing 0·20 of water.
Coke, pure	3917	
Coal, 1st quality	3917	Containing 0·02 of ashes.
„ 2nd „	3530	„ 0·10 „
„ 3rd „	3295	„ 0·20 „
Wood, kiln dried	2036	Of any kind; containing 0·52 of carbon.
„ air dried	1636	Containing 0·20 of water.
Turf, ordinary	833	
„ 1st quality	1666	Experiments of M. Garnier.

"But experience shows that the best furnaces do not render available more than 0·55 to 0·64 of the quantity of heat developed by the combustible; and it is easy to calculate after that proportion the quantity of heat rendered available in any given furnace from any combustible burnt in it."

Then follow concise rules for finding, "The quantity of heat in a given weight of steam;" "The quantity of fuel to be burned to produce that steam;" "The quantity of injection water required, &c."

All these are founded on the measure of heat just before established.

It is impossible not to see in these two cases a total difference in the character of the teaching. The two Tables depend ultimately on the same natural facts; but one takes them up near their origin, and exhibits them in their most naked and scientific state; the other deals with them only after they have become combined with other facts and are nearly ready for use. Both modes of exhibition have their value; but each of them is incomplete in its own way. He who should use Dr. Lardner's Table and nothing more, would find himself as incompetent to deal with actual questions respecting heat as though he had not read it at all: but from that Table he may go backwards to the principles which determine the heat-producing powers of different bodies, and forwards to practical devices and effects. In so doing, he will acquire a mass of valuable knowledge, of which that with which he started will be only one item, and he will acquire also a breadth of view which practice alone cannot impart. He who works by M. Morin's Table, may calculate with some good degree of rough correctness the quantities of water, fuel, and steam concerned in any operations to which the particular directions of the book exactly apply; but *to him* all this is only arbitrary; he is as far as ever from knowing why these directions are true, or how they are to be extended to cases which M. Morin has not anticipated for him. To qualify himself for effective service, he must go to other and more varied sources of information: he must acquire exactly the same knowledge as that we have supposed to be acquired by him who has been first engaged on Dr. Lardner's Table; the only difference is, he begins at another point in the series.

These remarks go not to affirm that either class of books is defective. Their object is to caution readers from expecting more from them than it is of their nature to give. Nor is such a caution unnecessary. We have known those who, on the strength of having read a book much inferior to either of these, have deemed themselves ready for almost any scientific trust.

Both classes have their value, if duly used. A lawyer—with lawyer-like unity and circumscription of purpose, may wish on a particular occasion to refresh his knowledge of some branch of science. A man of education may wish to know mechanics or electricity, only as he knows Greek verbs or Indian antiquities. A student may want a book to begin with, not shallow, yet not difficult or obscure. Any of these may resort to Dr. Lardner's volume with great advantage. So also an assistant-engineer (his principal being busy with the chaffering duties of the profession), may go to books of the class of M. Morin's, and to few better than to that book itself, for rules and directions, ready to hand, in cases where

he cannot apply himself conveniently to the needful investigations; and he will go all the more safely if he knows also whence and how the naked rules of such books are deduced. But the man to use both kinds with the greatest benefit is the steady and intelligent workman who, with ample opportunities in his own occupation of observing natural facts and of testing scientific conclusions, employs such books as these to generalize his views, to ripen his experience, to extend his knowledge, and to explain the principles and difficulties of his daily work. From such books he may often obtain help he can get from no other quarter, repaying it to science with such new facts as none are so likely to catch from the scattering hand of Nature, as those who watch most nearly and constantly her vast and complicated operations. When our workmen generally thus render their necessary personal pursuits the means also of their own intellectual elevation, we may fairly and cheerfully say that society is achieving new and increasing triumphs, and is preparing for higher still.

While we deem the prevalence of the scientific character no fault of the volume under review, it is also fair to add, that where the subject itself depends more closely on practical details, those details are not spared. A comparison between the former and latter halves of the volume will show that electricity has thus a full display of experimental devices, which "Heat" less admits, and in merely a scientific view, less requires.

THE TELEGRAPHIC LINES OF THE WORLD.

From the August number of the *Journal of the Franklin Institute*, we extract the following paper by Dr. L. Turnbull, in continuation of, and completing that which appeared in No. 1517 of the *Mechanics' Magazine*:

The following is a more correct list of the Telegraph Companies in the United States, obtained since the publication of my list in the July number of this Journal:

New York and Boston Magnetic Telegraph Company, from New York to Boston, about 250 miles; three wires, one passing through Providence, Rhode Island, the other through Springfield, Massachusetts, using the Morse patent.

Merchant's Telegraph Company, from New York to Boston, about 250 miles; two wires passing through Providence, using Bain's patent.

House's Printing Telegraph, from New York to Boston, 250 miles; one wire, using House's patent.

Boston and Portland Telegraph Company, from Boston to Portland, 100 miles one wire; using Morse's patent.

The Merchant's Telegraph Company have one wire from Boston to Portland, 100 miles; Bain's patent.

Main Telegraph Company, from Portland to Calais, Maine, about 350 miles; one wire; Morse's patent.

St. Johns' and Halifax Line, from Calais to Halifax, about 400 miles; one wire Morse's patent.

There is a line of Bain's telegraph from Boston through New Hampshire, to Burling, Vermont, thence to Ogdensburg, New York; about 350 miles; one wire.

New York, Albany, and Buffalo line, from New York to Buffalo, through Albany and Troy; 513 miles long; three wires; using Morse's patent.

New York State Telegraph Company, from New York to Buffalo, *viâ* Albany; two wires; 550 miles long; with a branch from Syracuse to Ogdensburgh, *viâ* Oswego; about 150 miles; one wire: also a branch from Troy to Saratoga, 36 miles; one wire; use Bain's patent. There is also a Morse line from Syracuse to Oswego; about 40 miles.

House Telegraph Company, from New York to Baffalo, *viâ* Albany, 550 miles; two wires; use House's patent.

New York and Erie Telegraph, from New York to Dunkirk, *viâ* Newburgh, Binghamton, and Ithaca, 440 miles; one wire; Morse's patent.

New York and Erie Railroad Telegraph, for railroad use, along the line of New York and Erie Railroad, 460 miles; Morse's patent.

Magnetic Telegraph Company, from New York to Washington, *viâ* Philadelphia; seven wires; 260 miles; Morse's patent.

House Line from New York to Philadelphia; 100 miles; one wire; House's patent.

Troy and Canada Junction Telegraph Company, from Troy to Montreal, through Burlington, Vermont, 260 miles; one wire; Morse's patent.

Erie and Michigan Telegragh Company, from Buffalo to Milwaukie, *viâ* Cleveland, Detroit, and Chicago; one wire all the way; second wire from Buffalo to Cleveland; 800 miles long; Morse's patent.

Cleveland and Cincinnati Telegraph Company, from Cleveland to Cincinnati; 250 miles long; two wires; Morse's patent.

Cincinnati to St. Louis, *viâ* Indianapolis; 400 miles long; one wire; Morse's patent.

Cleveland and Pittsburgh Telegraph Company, from Cleveland to Pittsburgh, 150 miles; one wire; Morse's patent.

Cleveland and Zanesville Line, from Cleveland to Zanesville, 150 miles; one wire; More's patent.

Lake Erie Telegraph Company, from Buffalo to Detroit, *viâ* Cleveland, 400 miles; one wire; Morse's instrument built under O'Reilly's contract with Morse, with branch from Cleveland to Pittsburg, 150 miles; one wire.

Cincinnati and Sandusky City Line, about 200 miles; one wire; Morse's patent.

Toledo to Terra Haute, *viâ* Forte Wayne, about 300 miles; one wire; Morse's patent.

Chicago to Dayton; one wire; Morse's line.

Chicago to St. Louis, *viâ* Peoria; about 400 miles; one wire; Morse's patent.

Milwaukie to Greenbay; 200 miles; one wire; Morse's patent.

Milwaukie to Galena, *viâ* Madison; about 250 miles; one wire; Morse's patent.

Chicago to Janesville; one wire; Morse's patent.

Buffalo and Canada Junction Telegraph Company, from Buffalo to Lamiston; one wire, connecting with a wire in Canada that runs to Toronto; about 200 miles.

Montreal Telegraph Company, from Toronto to Quebec, *viâ* Montreal; 600 miles; one wire; Morse's patent.

Montreal to By Town; one wire; Morse's line.

Having received later information in regard to some of the lines, I would make the following corrections to my article in the July Number.

No. 2. "Atlantic and Ohio Telegraph Line" is so referred to as to convey the impression that it ran from Philadelphia to Milwaukie; this is not the case; the line belonging to that company runs from Philadelphia to Pittsburg. The Lake Erie Telegraph Company have a line from Buffalo to Detroit, with a branch from Cleveland to Pittsburg.

No. 4. The New York, Albany, and Buffalo Telegraph, extends from New York to Buffalo, *viâ* Albany and Troy, 513 miles long, having eighteen stations between Buffalo and New York; connecting at Troy with Troy and Canada Junction Telegraph Company; at Syracuse with Syracuse and Oswego Telegraph Company; at Canadaigua with a line from Canadaigua to Jefferson, New York; at Rochester with a line from Rochester to Dansville, New York; at Buffalo with Buffalo and Canada Junction Telegraph Company, and with Erie and Michigan Telegraph Company; the latter extending from Buffalo to Milwaukie, *viâ* Cleveland, Detroit, and Chicago, 800 miles.

No. 6. There are three companies, if not four, owning the line from Boston to Halifax; from Boston to Portland there are two lines, one using the Morse instrument, and one the Bain instrument; from Portland to Calais, Maine, one company, using the Morse instrument; from Calais to Halifax, the Morse instrument is used; the line in each province is owned by separate companies, organized under charters from their respective legislatures.

No. 7. The New York and Boston Morse line extends from New York to Boston; to reach Halifax it connects at Boston with lines in No. 6. "Also from New York *viâ* Bridgeport to Birmingham, Connecticut, with eleven stations, there is no such line; there is a branch from New Haven to Waterbury, Connecticut; there is no intermediate station.

"In April, 1852, direct communication was had between the New Orleans Telegraph Office, and the office of the New Orleans line, in Hanover-street, New York; the whole extent of near 3,000 miles of wire having been successfully worked in one circuit."

The entire length of the line from New York to Orleans, *viâ* Charleston, Savannah, and Mobile, is 1,966 miles; and this distance was not worked in one circuit, nor can it be with either of the existing systems with the best mode of insulating in use. The instance of direct communication was secured by dividing the line into several circuits, probably five or six, and connecting those circuits through the agency of an instrument termed a connector, the effect of which is to cause one circuit to work the other through the entire series, thus producing a result similar to working through the entire line in one circuit. The connector is an instrument first invented and applied by E. Cornell, Esq., of New York, on the New York, Albany, and Buffalo line, at Auburn, New York, to work a branch line from Auburn to Ithaca, for the purpose of taking news reports at Ithaca; at the same time the wire being transmitted from New York to Buffalo on the main line; this was adopted in the year 1846; it was found to work admirably, and he afterwards modified it so as to make it applicable to working both ways in a main line, or, in other words, to make it capable of working a number of series of circuits in a main line; the instrument was adopted for this purpose on the New York and Erie and Erie and Michigan lines, in the year 1849, and has been in constant use ever since; by it they having

frequently worked direct from New York to Milwaukie, 1,300 miles. The instrument used on the New Orleans line, which was described in my Lectures on the Telegraph, was adopted by Mr. Charles Bulkley, the then superintendent of the line, who claims it as his invention, made in 1850 or 1851.

The greatest distance that Mr. Cornell has known any lines to work in *one* circuit, was from Boston to Montreal, *viâ* New York, Buffalo, and Toronto, a distance of about 1,500 miles; this, however, was done when the earth was frozen, and the lines thus insulated by the frost much better than man has yet contrived to insulate them without its aid. There are no lines working successfully in *one* circuit more than 550 miles; lines may be so insulated as to work in one circuit under states of the atmosphere from 800 to 1,000 miles.

"The Atlantic and Pacific range, under the arrangement of Henry O'Reilly, Esq.; using a modification of Bain's Chemical Telegraph and Morse's instrument, from New York to Washington and New York to Boston, &c., &c." Mr. O'Reilly has nothing to do with either of those lines; he was contractor for building one of them, but has no interest in them and no control over them. The lines in the west are owned by separate independent companies, over which he has no control. The line from St. Louis to Fort Leavenworth, O'Reilly has nothing to do with; it has been built by other parties in direct opposition to all of O'Reilly's movements.

The Bain Lines in the United States are as follows:—"One from New York to Boston, two wires; one from New York to Buffalo, two wires."

In the list of lines, there are "No. 2, from Washington to New York, *viâ* Baltimore and Philadelphia, 5 wires, 250 miles each, 1,250 miles; at No. 8, Philadelphia to New York, 6 lines, 120 miles each, 720 miles." Those are the same lines each, and they have been duplicated. Including the Bain and House lines, there are only 8 wires between New York and Philadelphia; the ninth one is now being put up by the Magnetic Telegraph Company.

No. 15. Bridgeport and Birmington line has not been in use for two years; is taken down.

No. 22. Troy to Whitehall, *viâ* Salem, not been at work for more than a year.

No. 25. Auburn to Elmira, *via* Ithaca, taken down more than a year ago.

No. 26. Binghamton to Ithaca, *viâ* Oswego, is a part of the New York and Erie line mentioned at No. 14, from New York to Fredonia.

No. 31. Cleveland to Pittsburg, *viâ* Alton, Illinois; this is an error, as Pittsburg is in Pennsylvania, east of Cleveland, and Alton is in Illinois, west of Cleveland more than 500 miles.

No. 33. *No such line as* from Pittsburg to Columbus, 680 miles; No. 34. No such line as this; there is a line from Columbus, Ohio, to Portsmouth, Ohio, about 100 miles.

No. 37. Columbia to Chilicothe is the same line as referred to above, No. 34.

There is not over 2,200 miles of House wire up. "The 6,000 miles of O'Reilly's lines" are, to a great extent, embraced in the 17,283 Morse lines, and also embraced in the 1,092 miles of Bain's line.

There is an "Erie and Alleghany Telegraph Company," having a line from Dunkirk, New York, *viâ* Warren, Panama, thence to New Castle, Panama, and thence to Pittsburg.

Consolidation of Telegraphs.—We learn from the Cincinnatti papers, that all the leading telegraph lines in the west, and south, and north-west, have been united in business interests. The New Orleans and Ohio line, extending from New Orleans to Pittsburg; the People's line, from New Orleans to Louisville; the two wires, Louisville, Cincinnatti, and Pittsburg line, and the western line from Wheeling and Pittsburg to Baltimore and Washington city, are all direct parties to the contract—securing these arrangements.

The union brings the Morse and O'Reilly offices in Cincinnatti and all other cities on the lines named together. In Cincinnatti the Morse lines are removed to the O'Reilly office, which will hereafter be known as the *National Telegraph Office.*

The lines connected directly by this union connect also indirectly with wires extending over thousands of miles, and embracing within their iron arms almost every city and large town in the United States. Perhaps there are no lines of equal extent in the world, or working together with equal harmony, as those radiating from the National Telegraph Office in Cincinnatti. They are seventeen in number, and embrace in all *ten thousand eight hundred and twenty-four miles of wire.*

The following report of the Cincinnati and Louisville Telegraph Company for 1850 and 1851 exhibits great enterprise, and the value of the telegraph as a mercantile investment in America. It appears that, during the preceding year, three dividends of three per cent. each had been paid, and one quarter's dividend retained for rebuilding the line. The whole sum expended for repairs up to June, 1851, amounted to 10,405 94 dollars. With this sum, 83 miles of poles have been reset, 146 miles put in repair, and 156 miles renewed. The receipts during the year 1850 were as follows:

Receipts.

	Dollars.
Louisville	22,000·08
Madison	2,155·99
Laurenceburgh	192·60
Cincinnati	18,470·97
Dayton	2,727·55
Springfield	631·37
Columbus	3,403·49
Janesville	1,628·36
Mt. Washington	72·37
Wheeling	2,525·71
Steubenville	878·08
Pittsburg	17,992·17
Total	73,278·72

Expenditures.

	Dollars.
Fuel, Gas-light, Candles, &c.	642·42
Rent of Offices, Bridges, &c.	1,558·70
Stationery of all kinds	1,253·61
Salaries	18,115·39
Refunded for despatches failing delivery	619·86
Repairs of the Line	7,663·30
Cost of Batteries	734·25
Miscellaneous	4,425·64
Total	35,013·67

Recapitulation.

		Dollars.
Total Receipts for 1850		73,270·72
Paid to connecting lines	24,788·45	
Expenditures	35,013·57	59,802·90
Total Residue		13,476·72

Statistics of the year 1850 :—Number of words transmitted, 3,602,760; number of despatches recorded, 364,559. These are exclusive of free matter, necessarily large at all times. Average hours of labour, fourteen per day. The record of despatches for 1850, on the paper of the registering instrument, covers a length of 1,704½ miles: number of hands employed, 58.

DURABILITY OF IRON SHIPS.

A circumstance strongly illustrating the durability of iron applied to the construction of ships, and which on that account is well worthy the attention of owners, is stated in the last impression of the *Liverpool Albion*. It appears that a fine iron vessel, called the *Richard Cobden*, is being overhaulded in the Canning Graving Dock at that port, and that Mr. W. F. Sim, the managing owner, with the view of ascertaining whether eight years of active employment between Liverpool and the East had occasioned any diminution in the thickness of her sides, directed a simple experiment to be made, which was attended with the most satisfactory result. A plate in the sixth tier from the keel was selected, which had the appearance of being in the worst condition of any, and which was certain to indicate the presence of corrosion, if corrosion there were. This plate was bored through, and upon a nice examination, its thickness was ascertained to be exactly nine-sixteenths of an inch, the thickness of the plate at the time the vessel was launched in July, 1844. The only traces of chemical action that presented themselves were at the bows, where the paint had been chafed by the anchor and chain, and the metallic surface thus became exposed.

THE IRON TRADE—BIRMINGHAM.

From the last export return of the consumption of iron, the unusual elevation in the price of the metal which has recently taken place is clearly apparent. The following is the statistical summary of the iron trade for the month ending on the 5th September, 1851, and the corresponding month in the present year. It exhibits a great increase, which must be attributed in a great degree to the increasing demand for the metal in America and on the European continent:

	1851.	1852.
Pigs	48,611	47,403
Bars and Rods	346,071	401,770
Cast	19,169	46,379
Wrought	137,066	176,949

PRICES OF IRON IN AMERICA.

By the advices brought to Liverpool on Wednesday, by the United States Mail steam-ship *Pacific*, which left New York on the 2nd inst., we learn that English and Scotch bar-iron has been sold at 45 dollars to 45 dollars 50 cents. Scotch pig iron in good demand at 25 dollars, cash, to 26 dollars 50 cents, six months.

CAPTAIN NORTON, ON SHOT AND PROJECTILES.

From the "Naval and Military Gazette."

Sir,—I gladly answer "A. C.'s" question contained in your last Number, and am of opinion that "the heat generated by the explosion" has some effect in expanding a leaden shot or bullet—as well as I recollect, I never wrote or said that it had not. Zinc, when heated to about 250°, becomes malleable and expansive, although when cast it is brittle, from being granular and formed of crystals. I have used hollow elongated zinc shot, containing its own charge or cartridge, from a musket fired into several planks of deal timber, and the shell of the zinc did not crack or split thin, which I
zinc being heated by the explosion of the charge. I have lately made experiments at Haulbowline with tin shells charged with fulminating mercury, and exploded under water, the result of which was very curious. A hogshead having a false bottom of elm 2 inches thick, in addition to its own of oak, was filled with water, and placed under a wall on two legs of wood to keep it about 6 inches from the ground. The shell of tin, like a small canister, 2 inches long, and three-fifths of an inch in diameter, was charged nearly full with fulminating mercury, about 2½ drachms; this shell had a percussion-cap fitted on its lower end, a little gutta percha paper being first placed over the tin tube or shell, and the percussion-cap over that; this made it waterproof; the upper end of the shell fitted on an iron round bar, with a shoulder on it, so as to enter the shell about half an inch, with gutta-percha paper interposed—this bar was about a foot long, and weighed little more than a pound; a shuttle-cock having four wings fitted on its upper end to cause it to fall perfectly point foremost. I held it about a foot above the water, and then let it fall as near the centre of the water as I could. It instantly exploded on the false bottom, and threw up a shower of water, which drenched me like a shower bath. About twenty persons were looking on, Lieutenant Wentworth, R. N., Messrs. Cramer, Bernard, &c., and four or five of the artificers, or men connected with the station, affirmed that the hogshead jumped up from its supporters 3 or 4 inches. These men stood close by the hogshead. I could see nothing from the effects of the shower bath. The oak bottom of the hogshead was breached through, the iron hoops burst off, leaving only the upper one, and when the cask was turned on its side to examine the false bottom, it showed an indentation about three-quarters of an inch deep, and about three-fifths of an inch wide; outside this indentation and round it was another, about the third of an inch deep, and about an inch and a half in diameter. This, I suppose, was caused by the explosion of the fulminating mercury immediately under the bar, having more force than that surrounding portion only confined by the tin tube, the iron bar affording a greater fulcrum or resistance. Two musket cartridges, or about ten drachms of gunpowder, exploded in the same manner, made no impression on the false bottom, and only sent up a few bubbles and smoke. Yesterday (Tuesday) I tested a hollow shot made two parts of zinc and one of block tin, containing its own charge of half a pound of gunpowder, and weighing altogether seven pounds, from a brass six-pounder field-gun, the shot being a cylinder with hemispherical front fitted closely. It was fired at 15 yards distance, and penetrated a bulk head of yellow pine of 15 inches thick, and 6½ feet into firm blue clay; the edge of its base, being a quarter of an inch thick, did not expand, but I will have it turned thinner, when I expect that it will expand. It was turned out of the solid by Mr. Austen, of Cork, and was not in the least injured by firing in the gun, or passing through the bulkhead, and only received a few slight indentations in its front from passing into the clay mound and striking small stones. Its diameter was 3 inches five-eighths, and its cylindrical length 4 inches. I have proved that I can have a percussion shell to act with certainty at the distance of 15 yards, and I am in hopes of doing so in long ranges; if so, the shot or shell may be formed of cast iron made malleable. My first trial was with a similarly-formed shot of cast iron, but it was brittle and broke in the gun. The second shot was of zinc two parts, and lead one; these metals did not amalgamate, and this shot also broke in the gun; but the two parts zinc and one block-tin promise well, and if I can bring it to perfection, the ample means afforded by Admiral Purvis, under instructions from His Grace the Duke of Northumberland, and the Board of Admiralty, will enable me to do so.

I am, &c.,

JOHN NORTON.

Cork, September 15, 4852.

Note.—In consequence of the departure of the *Ajax*, the second trial with this shot has been postponed.

[We understand that Lord Hardinge, in his capacity of Master General of the Ordnance, has reported to her Majesty, that Captain Norton is the original inventor of the Minié ball.—ED. M. M.]

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING OCTOBER 14, 1852.

Edward Hammond Bentall, of Heybridge, iron-founder. *For improvements in the construction of ploughs.* Patent dated March 25, 1852.

The *first* of these improvements has relation to the beams of ploughs, and consists in constructing the same of a combination of two bars of iron, either flat or curved. In the former case, the bars are formed with longitudinal ribs or projections at the sides, by which considerable additional strength is gained by a very trifling increase in the weight of metal. This mode of constructing the beam offers peculiar facilities for connecting the coulters, which may be simply inserted between the bars, and secured by a bolt or rivet.

The *second* improvement consists in a mode of constructing turn-wrest ploughs. Here two distinct ploughs are combined with a single beam, one plough consisting of share-coulters and guiding wheels being attached to the upper side of the beam (which is made perfectly straight), and the other to the under side. One set of handles only is employed, and they are so fastened to the plough-body as to admit of their being set to suit whichever of the ploughs may be, for the time being, in operation. When the plough has arrived at the end of a field, the horses are turned, the plough reversed—that is, turned upside down—and the ploughing continued in the opposite direction.

The *third* improvement consists in attaching the share of ploughs to the spit by means of a square or oblong slot and wedge, instead of the usual circular hole.

Claims. — 1. The construction of the beams of ploughs from bars of iron furnished with projecting ribs or flanges at the sides, for the purpose of strengthening the same. Also, the use of curved bars for the same purpose.

2. The mode of constructing turn-wrest ploughs, in which the frames which carry the ploughs are fimly fixed by bolts or rivets, otherwise direct to the brace, which, therefore, must be turned over upside down, when the uppermost plough is required to be put in operation.

3. The use of a rectangular slot and wedge for fastening the share to the spit.

John Smith, of Bilston, Stafford, brass-founder. *For certain improvements in locomotive and other steam engines.* Patent dated March 25, 1852.

Claim.—The application to locomotive and other engines of a moveable valve, by means of which the induction pipe may be converted into the eduction pipe, or *vice versâ*, at pleasure, and the motion of the engine thereby reversed, and whereby also the engine may be stopped if required.

Jean Jacques Bourcart, of the firm of Nicholas Schlumberger and Co., of Guebwiller, France. *For improvements in preparing, combing, and spinning wool, and other fibrous materials.* (Partly a communication.) Patent dated March 27, 1852.

William Thompson, of Salford, machine maker, and John Hewitt, of Salford, machine maker. *For improvements in machinery for spinning, doubling, and twisting cotton, and other fibrous substances.* Patent dated March 27, 1852.

These improvements have relation to what are known as "self-acting mules," and consist,

1. In an improved combination of parts for changing the position of the fullers, and for throwing the putting-up catch-box into gear.

2. In an improved combination of parts for moving the strap from the twist pulley on to the loose pulley, and for putting the break on the twist pulley.

3. In an improved mode of putting the drawing-out wheels into gear for preventing the breaking of the teeth, and allowing them to draw out of gear when an obstruction occurs in the going out of the carriage.

4. In an improved combination of parts for putting up the carriage.

5. An improved mode of connecting the winding-on chain to the radial arm.

6. In an improved combination of parts for changing the position of the winding-on chain according to the tension of the yarn.

7. In constructing the copping rail and shaping plates of the same piece.

8. In the application of self-acting machinery for moving the driving strap from the fast to the loose pulley during the running in of the carriage.

James Timmins Chance, of Handsworth, Stafford, glass manufacturer. *For improvements in the manufacture of glass.* (Partly a communication.) Patent dated March 29, 1852.

This invention consists in the application of anthracite, or stone coal, in the manufacture of glass.

The fuel hitherto used for this purpose has been for the most part bituminous coal, but this evolves so much smoke as to produce an injurious effect on the colour of the glass manufactured; and it is with a view to prevent or obviate such injurious consequences that the present improvements have been devised.

The furnaces for burning this description of fuel require to be very little altered from the construction at present in use. The fuel will be supplied by feed apertures, and suitable pipes must be added for introducing a blast of air, which blast may be created by fan or other blowers. The air may be heated by interposing a suitable heater between the blower and the furnace, but the heating is not considered necessary. The beds of the furnaces should be closed, which may be done by "loaming" over the grate bars, or by introducing a moveable plate beneath them; and the ash-pit should be made deep enough to contain a considerable quantity of ashes. The pots are of the usual construction, and they should be placed on sieges elevated above the orifices of the blowing pipes to an extent that will admit of the flame being directed against the lower as well as the upper parts of the same.

Claim.—The application of anthracite or stone coal in the manufacture of glass.

JAMES MELVILLE, of Roebank Works, Lochwinnoch, Renfrew, calico-printer. *For improvements in weaving and printing shawls and other fabrics.* Patent dated March 29, 1852.

1. The "improvements in weaving shawls and other fabrics" consist in manufacturing piled fabrics without the use of wires, by weaving simultaneously two fabrics held together by the pile threads, and then severing the same, by which means two perfect cut-piled fabrics will be produced.

2. The "improvements in printing shawls and other fabrics" consist in causing the fabric to be stretched on an impression-drum or cylinder whilst undergoing the said operation, and in the employment of conical printing-rollers. A peculiar effect will be produced by stretching squares of some kinds of fabrics into round figures on a flat table, and then printing them with conical rollers. By this means the printed figure will retain its correct form at those parts of the fabric constituting the corners, and which are least stretched, but will be elongated and distorted at the sides, where the greatest tension has been applied.

CHARLES JACK, of Tottenham-court, New-road. *For improvements in machinery for grinding pigments, colours, and other matters.* Patent dated March 29, 1852.

These improvements consist in causing the pigments, colours, or other matters to be ground between a roller and a concave surface, in contact with which such roller revolve. The pigments, first roughly mixed with water or oil, are passed through a pair of rollers, or a roller revolving in contact with the grinding roller, and then between the roller and the concave surface, the distance between which may be varied according to the nature of the substance operated on. The pigment, after being ground, is removed from the periphery of the roller by means of a scraper in contact with which the roller revolves.

JOHN WHITEHEAD, of Holbeck, York, machine manufacturer. *For improvements in machinery for preparing, combing and drawing wool, silk and other fibrous substances.* Patent dated March 29, 1852.

Claims.—1. An arrangement of machinery, or any modification thereof for preparing wool, silk, cotton or other fibrous substances, when such operation is performed by lashing the staple on to a screw-gill drawing head by means of a revolving drum or cylinder, covered with cards, combs, or teeth.

2. Several arrangements of machinery for preparing and combing wool, silk, cotton or other fibrous substance. Also, the filling a central travelling comb, by means of one, two, or more traversing or reciprocating screw-gill drawing heads, placed on each side of the same, and the application to such travelling comb, of two or more drawing-off heads on each side of the same.

3. An arrangement of apparatus for raising and lowering the gill fallers, instead of the cams ordinarily used for that purpose.

MOSES POOLE, of the Patent Bill Office, London, gentleman. *For improvements in fire-arms.* (A communication). Patent dated March 31, 1852.

These improvements have relation to what are known as "breech-loading fire-arms," and consist in so constructing the same, that the cartridge is introduced from behind in a line with the axis of the bore of the barrel, and the end of the cartridge is sheaved off, so as to expose the powder therein to the effect of the percussion cap, by the action of closing the loading aperture at the breech. The nipple also is removed out of reach of the hammer when the breech plug is removed for loading, so that all danger of accidental discharge during the operation of loading is prevented.

The barrel of the gun is bored clear through from the muzzle to the breech, and is counter-bored at that part for the more ready introduction of the cartridge. The breech plug moves vertically up and down in a slot formed through the barrel and stock, and carries with it the nipple, which is attached to it, an aperture being formed through the plug to communicate with the charge. The upper side of the plug is formed with a shear edge, which effects the cutting off the end of the cartridge when the

plug is raised. The plug is lowered and raised by means of a lever operated from beneath, and this lever is so formed, that when the plug is raised, it assumes the position of, and becomes, in fact, the trigger guard. A catch is provided at the rear of the trigger for locking the end of the lever at the time of the discharge.

Claims as above.

JOHN FLACK WINSLOW, of Troy, New York, United States, iron-master. *For improvements in machinery for blooming iron.* Patent dated March 31, 1852.

These improvements consist in combining the use of the hammer with machines for blooming iron, by pressure between rollers, by which the advantages of both these methods of working are secured, without the attendant defects of either. The hammer may be combined with any species of rolling machinery, but Mr. Winslow has shown it applied to a rolling-mill of his own invention, patented in England October 14, 1847, in the name of Mr. A. V. Newton. The hammer may be worked by cams, or by a steam cylinder, or other means capable of imparting to it a rapid reciprocating motion, so as to cause it to give to the iron under operation a rapid succession of sharp smart blows.

Claim.—The application of a reciprocating hammer to machinery for blooming iron operating by a rolling pressure, whereby impurities aremore effectually removed from the iron, and the metallic mass consolidated and condensed.

WILLIAM EARNSHAW COOPER, of Mottram, Chester, tallow chandler. *For certain improvements in the manufacture of candles and candle wicks, and in the machinery or apparatus employed therein.* Patent dated April 2, 1852.

The *first* of these improvements consists in making candle wicks with one-third, or thereabouts, of the strands, saturated with a solution of bismuth, in oil, or with any other solution by which the burning properties of the same are increased; the object being to cause the wick thus prepared to turn out of the flame when being burnt, and so to obviate the necessity for snuffing.

The *second* improvement consists in forming the rod or stick on which the wicks of dip-candles are placed for dipping, of a triangular form, and with grooves on one side for keeping the wicks at their proper distances apart.

Claims.—1. The wick prepared, made, and manufactured, as described.

2. The rod or stick of the form described, made and used as above set forth.

MOSES POOLE, of London, gentleman. *For improvements in covering wires for telegraphic purposes.* (A communication.) Patent dated April 6, 1852.

1. It is proposed to cover telegraphic wires with a flexible varnish of bitumen, or of bitumen mixed with gutta percha or India rubber, or both, before applying a final covering of insulating material.

2. For the purpose of covering wires with fillets, or bands of india rubber or gutta percha, the patentee employs an arrangement of machinery, by means of which the wire, as drawn through the apparatus, has one or more coatings wound spirally round it. A solution of india rubber may be applied before laying on the second coating, in order to cause the two to adhere more perfectly together. With respect to the use of gutta percha, the patentee remarks that when uncombined with other materials, it becomes deficient in insulating power, and he therefore mixes with it one-sixth part, or thereabouts, of india rubber, by which this objection is overcome.

3. When several coatings of the same or different materials are required to be applied to wire in a plastic state, the patentee constructs what may be called a compound die, having several dies or moulding orifices, through which the wire to be coated is passed in succession.

Claims.—1. The covering of wires with a flexible varnish of bitumen, and then applying gutta percha or other insulating material. Also, combining india rubber or gutta percha, in combination with bitumen, as a flexible varnish or coating.

2. The mode of applying coatings and successive coatings of gutta percha or india rubber, or of gutta percha and india rubber to telegraphic wires.

3. The combination and use of apparatus for employing two or more dies, or moulding-orifices, for applying successive coatings to wires.

JOHN WALTER DE LONGUEVILLE GIFFARD, of Serle-street, Lincoln's Inn, barrister-at-law. *For improvements in fire-arms and projectiles.* Patent dated April 6, 1852.

The "improvements in firearms" consist in constructing the barrels of the same in such manner that the breech shall project into the interior thereof, whether the barrels are rifled or otherwise. The touch-hole is carried through the centre of the projecting part of the breech, so that the charge or cartridge in the gun is ignited at the centre when discharged.

The "improvements in projectiles" consist in forming hollow balls with internal thimbles of hard metal, such as tin plate. When the hollow balls are made of sufficient length to contain the powder within them,

the patentee covers the ends with perforated paper, to facilitate the powder, being exposed to the action of the percussion cap, when such a ball is used in a gun where the breech projects into the barrel, as before described.

Claims.—1. The construction of firearms with the breeches projecting inwards.

2. The construction of projectiles with internal thimbles of hard metal.

Joseph Pimlott Oates, of Lichfield, surgeon. *For certain improvements in machinery for manufacturing bricks, tiles, quarries, drain-pipes, and such other articles as are or may be made of clay or other plastic substances.* Patent dated April 6, 1852.

The patent extends to the Colonies only, and the specification is therefore a mere transcript of that previously enrolled. The English patent dated October 9, 1851 (see vol. lvi. p. 306).

Samuel Fox, of Stocks Bridge Works, Deepear, near Sheffield. *For improvements in umbrellas and parasols.* Patent dated April 6, 1852.

These improvements consist in making the ribs and stretchers of umbrellas and parasols of thin steel bent into a hollow trough-like form. The bending is effected by passing the strips of metal between suitably-shaped rolls, annealing the same as frequently as required, and the ends are then compressed between dies, so as to give the requisite form for enabling them to be used in manufacturing the umbrellas and parasols.

Claim.—The improvements described in the manufacture of umbrellas and parasols.

Specification, Due but not Enrolled.

Thomas Bell, of Don Alkali Works, South Shields. *For improvements in the manufacture of sulphuric acid.* Patent dated March 24, 1852.

NOTICES TO CORRESPONDENTS.

"*Shy*" suggests the employment of oil in gas-meters, as being likely to obviate difficulties arising from the action of water upon the metallic surfaces of the instrument. One objection to the use of oil for this purpose is, that it freezes at a higher temperature than water, and therefore that an oil-meter would become paralyzed in situations where a water-meter would continue its functions. Another objection is, that the ammonia and sulphuretted hydrogen brought over with the gas would probably form a pasty insoluble mass with the oil, of greater specific gravity, and, gradually accumulating as it sunk, ultimately occasion an overflow. The fitness of oil for the purpose has not escaped attention.

J. C. West.—The plan of the machinery for your proposed water-propeller is characterized by much ingenuity and simplicity, but the principle of the process is altogether wrong. It is well known that the reaction of water against water is scarcely appreciable, of which any one may satisfy himself by observing how a fine stream of water falling into a body of water actually pierces it, and even carries along with it a great number of particles of air. The reaction of air against water would seem to offer better prospects of realizing a practical moving force; but in this case it would be necessary that the process of condensing the air should go on with inconvenient rapidity.

"*A Subscriber*" has forwarded to us the sketch of an instrument, or rather a geometrical construction suggesting its principle, the object of which is to describe the involutes of certain curves. The investigation has evidently been pursued at the expense of much thought, but it does not appear that the construction of the instrument, founded upon the result of the geometrical operations, is anywhere pointed out. From the nature of involutes, their formation from their evolutes does not present any mechanical difficulty—certainly nothing to require a complicated arrangement. If the intention of the geometrical construction be to show how the curves may be described by points, we do not see how any instrument can trace the locus of the point found; and it would still be more easily, and probably more accurately constructed by the unwrapping of a string from the evolute.

"*D. E. F.*" communicates a mode of laying down lines of railway, by employing, in the first place, blocks of stone embedded in the earth, each carrying a sleeper of suitable length, so as to make a continuous, or an interrupted longitudinal wooden bearing, as may be desired, and then imposing upon this the rail. A groove is cut in the upper surface of each block of stone to receive the wooden sleeper; half the thickness of which, or thereabouts, is to be placed in it. Supposing this combination of stone, wood, and iron to be advantageous for the purpose intended, it seems necessary that some provision should be made for securing the sleeper in its position, and guaranteeing its permanent steadiness, notwithstanding the effects of weather and time. The letter and plans of "D. E. F." do not embrace this point, but our correspondent appreciates the importance of better securing the chair upon the sleeper, and proposes an arrangement for the purpose, which is certainly ingenious, and which in practice would probably be attended with considerable advantage. On either side of the chair two nails are driven into the wood, the one inclining inwards and the other outwards, with an angle of about 40 degrees between them. Their joint effect would be that of a wedge resisting any upward tendency of the rail and chair. Through the head of each nail a hole is pierced, and through both holes, adjusted to lie in the same straight line parallel to the rail, a bolt is passed having a solid head. The head is brought home to one nail, and the pointed end firmly driven into the wood outside the other, thus keeping both fixed notwithstanding the oscillatory state of the structure when trains are passing. "D. E. F." proposes to use larger bearings of stone and of wood where a joint occurs in the line of rail, and he goes minutely into the general details of the subject. The above, however, are the principal features of the project. The disfavour in which stone bearings of any kind are viewed would most likely prevent a recurrence to that primitive method, though the evils incidental to it are here removed, or much lessened. Upon the whole, however, we are induced to doubt very much the superiority of the system proposed, in the opinion of railway engineers, with reference to questions of economy and mechanical efficiency.

WEEKLY LIST OF NEW ENGLISH PATENTS.

William Edward Newton, of Chancery-lane, Middlesex, civil engineer, for improvements in steam and other gauges. (Being a communication.) October 11; six months.

Richard Archibald Brooman, of Fleet-street, London, patent-agent, for improvements in mowing, cutting, and reaping-machines. (Being a communication.) October 14; six months.

Walter Ricardo, of the firm of A. and W. Ricardo, of London, share-broker, for improvements in gas-burners. (Being a communication.) October 14; six months.

Thomas Carter, of Padstow, Cornwall, ship-builder, for improvements in propelling. October 14; six months.

John Field, of Warnford-court, Throgmorton-street, for improvements in transferring and printing. October 14; six months.

LIST OF IRISH PATENTS FROM THE 18TH OF AUGUST TO THE 1ST OF OCTOBER, 1852.

Joshua Crockford, of Southampton-place, Middlesex, gentleman, for improvements in brewing and in brewing apparatus. September 7.

Henry Bessemer, of Baxter House, Old Saint Pancras-road, Middlesex, for improvements in expressing saccharine fluids, and in the manufacture of refining and treating sugar. September 11.

LIST OF PATENTS APPLIED FOR UNDER THE NEW ACT.

NAME.	TITLE.	DATE.	NATURE OF SPECIFICATION.
Bates, Edwin	An invention for retarding and effectually stopping at discretion railway carriages, and also for carriages of all descriptions, for the more safely descending inclined planes, either in the streets, or on turnpike roads, to be called "Bates's Break."	October 1.	Complete.
Ommanney, Henry Mortlock.	An improvement in the manufacture of guns, cannon, and other ordnance.	October 1.	Complete.
Ommanney, Henry Mortlock.	An improvement in the manufacture of cylinders for hydraulic presses and other engines.	October 1.	Complete.
Ommanney, Henry Mortlock.	An improvement in the manufacture of wheels for railway carriages.	October 1.	Complete.
Ommanney, Henry Mortlock.	An improvement in the manufacture of stamp-heads for crushing ores.	October 1.	Complete.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Oct. 12	3379	A. Lyon and S. Middleton	32, Windmill-street, City .... Finsbury	Seamless lithographic roller.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Oct. 5	473	Joseph Lynn Moore	Dorking, Surrey ,....................	Improved cricket stumps
7	474	John Hambleton ...	Brownlow-hill, Liverpool	Perforated sieve cradle.

CONTENTS OF THIS NUMBER.

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ROBERTON'S PATENT EXTRACT APPARATUS.

Fig. 1.

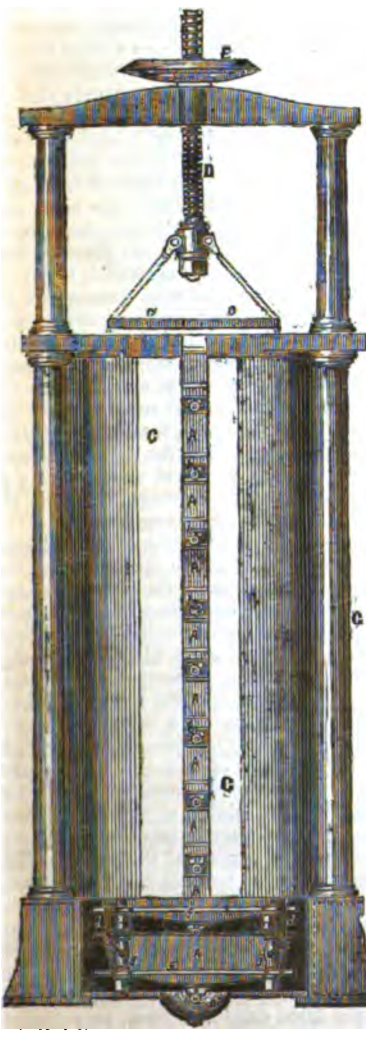


Fig. 4.

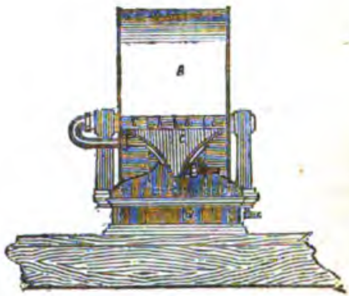


Fig. 3.

ROBERTON'S PATENT EXTRACT APPARATUS.

(Patent dated August 21, 1851. Specification enrolled February 21, 1852.)

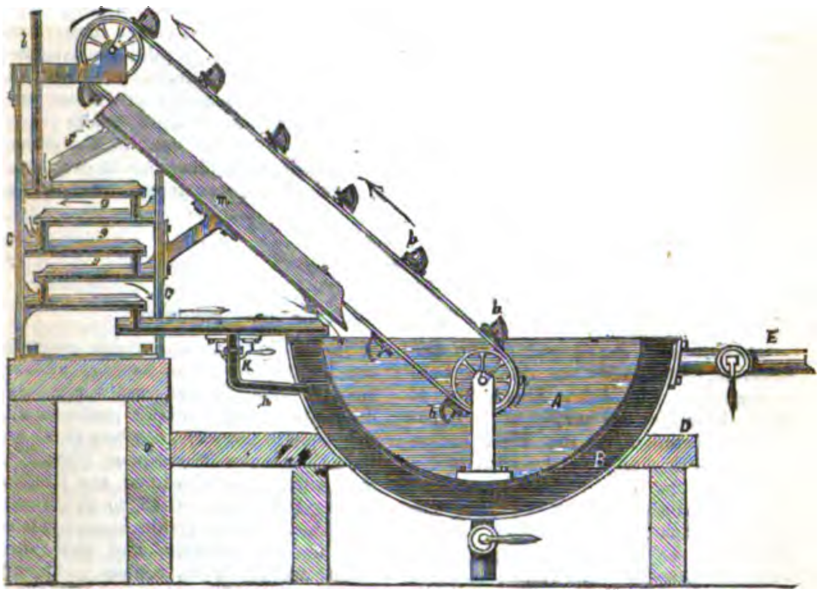
This patent is directed to the accomplishment of two principal objects—first, to the production of colouring matter from dye-woods and extractive matter generally; and secondly, to the more rapid and perfect concentration, by evaporation, of the extracts so obtained; the more rapid vaporization of simple infusions or decoctions, or the expelling of water or other fluid from any matter which it is required to desiccate.

The apparatus employed by the patentee for the first purpose, is shown in part in fig. 1, where A, A, A, &c., represent a convenient number of pans or vessels suspended vertically within the cylinder C C from a crosshead *c c*, which itself hangs by chains from a central screw-shaft D. By means of a wheel E the screw-shaft D may be raised or lowered, and along with it the pans, A, A, A, &c. The pans are proposed to be of metal, and coated, if necessary, with enamel or any other substance that will not act chemically upon their contents. To each pan is fitted a false bottom of woven wire network, or of perforated metal, supported a little below the bottom, for the purpose of properly delivering the extract into the pan immediately underneath, through the valve *b*. The valves *b* are worked from the outside by a lever. The mode of using the apparatus is this:—Into the pans is first put a charge of the dye-stuff from which the extract is to be made, and the charge in each pan is to be saturated with water poured in at the top of the apparatus. One-tenth of the entire extract is then drawn off into a receiver B, from whence it may be at once taken and stored away in casks. The next step is to raise the pans in the cylinder by turning the wheel E, and a pan filled with fresh dye-stuff is introduced in the place of that which has yielded up its extract, while the uppermost pan is removed. Upon an examination of the removed pan, its contents will be found to have parted with all the dye that can be taken from them at the temperature that has been determined upon. The material which comes away from the machine may be subsequently operated upon to obtain an inferior quality of extract, and may be worked over again, either alone or together, with fresh material, in a separate machine, so as to keep the fluid at any required temperature up to the boiling point. The space G G of the cylinder C C, which partly surrounds the pans, is kept filled with steam, to ensure a tolerable uniformity of temperature during the work. Around the pans are placed rims of metal *f f*, which are kept rigidly in their places by metal staunchions *g g*, which stand one upon the other, and are fitted with hooks or rings, to which the lifting chains may be attached, if that mode of suspension be resorted to.

The patentee proposes to adapt this apparatus to the preparation of dry albuminous extracts of meat by the use of cold water. For this purpose, having taken the desired quantity of undressed meat, carefully separated from it the fatty parts, and cut it by machinery or otherwise into minute fragments, like sausage-meat, he puts equal portions of it into six or more suitable pans of the above construction, on two endless chains. As, however, the extract obtained by cold water will not discharge itself through the false bottoms without pressure or stirring, he temporarily fits into each pan a circular piece of wood or flat metal of the diameter of the pan itself, which he presses down upon the contents of the vessel by means of a lever-handle or a screw and crosshead. The contents being thus discharged, the pressure is brought back, and the meat is stirred up to receive its next supply of solvent. In the ultimate solution thus obtained, all the nutritious properties of the meat will be found, while the residue will contain the gelatinous matter not soluble at the temperature employed for the extraction of the albuminous. The extract so made is afterwards evaporated to dryness by means described in the second portion of the patent. The inventor states, as the result of his experience, that the product in most instances amounts to from an ounce to an ounce and a half of dry extract for each pound of the best young meat, and consists of particles of a light brown colour and pulverulent nature, which may be kept in bottles or canisters undeteriorated for an indefinite length of time. Mixed with farinaceous substances, it would form an excellent substitute for solid animal food. By increasing the temperature, the gelatinous residue may be treated, either separately or with the dried extract of meat, as an article

of food in a new form, or the dry albuminous extract may be mixed up with flour and formed into biscuit or bread. This apparatus is to be modified when the extractive matter requires alcohol, naphtha, or acid for a solvent; and when two or more different properties, soluble at different temperatures or by different solvents, are to be extracted, certain simple modifications are necessary, which are fully explained.

Fig. 2.



With regard to the second part of the invention, fig. 2 exhibits a side elevation of the apparatus employed. A series of slightly-inclined metallic shelves *g*, *g*, *g*, are placed in the manner shown in the figure. A is a pan of metal, properly coated, if necessary, and surrounded by a steam jacket S S. The extract to be evaporated is conveyed into this pan, and the buckets *b b*, &c., attached to endless chains, and susceptible of transverse and longitudinal enlargement to any required capacity, dip into it. The pulleys which convey the endless chains are worked by hand, and the buckets then carry a portion of the extract to the upper pulley, over which it is tilted upon the metallic sloping shelf *f*. From this the liquid extract flows successively over the heated evaporating surfaces *g*, *g*, *g*, until it returns in a highly concentrated state into the pan A, or another suitable receiver. To prevent the adhesion of the concentrating liquid upon the shelves, by which a non-conducting film would be created, the occasional use of a scraper is recommended. The arrows indicate the course of the substance, and the process is continued until the desired consistency is attained. In order to heat the evaporating shelves *g*, *g*, *g*, steam is passed underneath them by means of a tube *h* attached to the jacket, by jets of gas or otherwise. If steam be used, the temperature is regulated by the steam-cock *k*, and allowed, if necessary, to blow off through a tube *l*. A tray *m* is intended to catch the droppings from the buckets, and to return them into the pan A. C is a metallic chamber, in which the evaporating trays are fixed. Fig. 3 is another simple form of evaporating apparatus, shown in elevation. Its construction is as follows:—A is a hollow cylinder, turned with precision, heated by steam or gas, and made to revolve upon its axis.

Scrapers *b b* of wood or metal are fixed upon its outer face, which are pressed against it by springs *c c* or otherwise, to scrape off any extract that would adhere to the cylinder as it revolves. The extract to be evaporated flows regularly into the shallow well *d* in which the bottom part of the cylinder is immersed, and as the cylinder revolves in the direction of the arrows, it brings up the extract in thin films, the aqueous particles of which are rapidly dissipated by the heat, and the extract thickens to the consistency of treacle. If required, it may be delivered in a dry state over the scrapers into a receiver; and several cylinders, arranged to act in succession on the same substances, may be employed according to circumstances. When a single cylinder is used of, say 15 inches in diameter, and the extract is rather highly evaporated, the speed of the cylinder to obtain a thick product of pilular consistency should not exceed six revolutions a minute. If several cylinders are used the speed may be proportionably augmented, and a larger quantity of extract operated upon with the same supply of steam. In this case the steam is made to pass from the hollow axle of one cylinder to the hollow axle of the next in succession, and the escape of the steam is prevented by a cone-joint or stuffing-box in each axle, which is kept firmly in its place by means of a common union screw. Fig. 4 is an end elevation of the above apparatus.

THE DIAGONAL PRINCIPLE—LAUNCH OF THE "SEGUNDO."

On Saturday, the second of the five steamers, constructed on the diagonal principle by Mr. John Thompson, of Rotherhithe, for the service of the Spanish Government in the West Indian seas, was launched from the slips of his yard, adjoining the Commercial Steamboat Pier, Rotherhithe. The sister vessel was launched from the same yard on Saturday, the 11th of September last, when the name of *El Primero* was bestowed upon her by Miss Honoria Marter. Both these vessels are of the same dimensions, and have been constructed from the lines of Mr. O. W. Lang, as he laid them down for the *Banshee*, whose performances, as a mail-packet, on the Holyhead station, occupy a distinguished place in the proud annals of the steam navigation of the present day. These "diagonal" vessels have realized new triumphs for that highly ingenious and eminently successful principle of construction, and it is a fortunate circumstance for the shipping interest that it should devolve upon a builder of Mr. Thompson's abilities to develop so far its superior qualities. Arranged as the timbers of these vessels are, they form a diagonally-trussed frame in every direction, the strength of which is easily understood; as it promotes a transmission and distribution of any undue strain, while the safety of the structure is immensely increased.

In this mode of construction, sections of the vessel taken at suitable points of her length, and as an average distance apart of about 9 feet, and temporarily hung up in their proper positions with reference to the ways. Along these sections the planks of the inner "shell" of the vessel, as it is termed, are laid, inclining at an angle of 45° to the line of midships. These planks continue from gunwale to gunwale, and have their edges accurately in contact. Outside these are placed the planks of the middle shell, also inclined at an angle of 45°, but in a contrary sense to those of the inner shell, and therefore intersecting them at right angles. At the intersection of each pair of seams, the two shells are firmly united by copper rivets, and outside all comes the exterior shell, the planks of which are laid in the usual manner, but with the precaution of covering the lines in which the intersections of the inner cores lie, and terminating in a rabbet in the stem and the stern. The keel is bolted strongly through the mass to the floors and futtocks, which are similarly secured. Between each pair of shells a layer of patent felt cloth, saturated with tar, is placed, which tends still further to augment the security of the whole mass. Both the *Primero* and the vessel launched on Saturday, the *Segundo*, are divided into three non-communicating segments by bulkheads of similar construction. Each shell is made of inch-and-a-half planks of fine mahogany,

worked up with the accuracy of a piece of joinery, and all the interval connections are extremely perfect. From the nature of the construction it is evident that, so long as one division of the vessel is free of water, or so long as one case remains together, there is safety for the crew, and in the last extremity a large shattered fragment of the sides of the vessel must form an admirable raft. With these successful examples of the application of the diagonal principle before our eyes—remembering, too, the excellent working of some of the Woolwich and Brighton boats, which were built by Mr. Thompson on the same general rules as the boats built by him for the navy,—it is to be hoped that still further efforts will be made to perfect it by extending it to every service in which its peculiar features can be advantageous.

The dimensions of the two vessels are —170 feet between the perpendiculars, 20 feet width of beam, excluding the paddle-cases; 360 tons register, and drawing only 5 feet of water when carrying their stores, arms, and all equipments. As they will be employed to defeat any privateering expeditions that may again be directed against the shoal-water coasts of Cuba and the smaller Spanish islands, they promise to be exceedingly serviceable in that capacity. Each will carry two 32-pounders, and each displays at its figure-head, richly carved and highly emblazoned, the arms of the Spanish monarchy.

Nothing could be more easy or more beautiful than the launch. At the word "down with the dog-shores," and after a turn or two on the lever of the jack, the mass commenced its descent along the ways with a velocity scarcely perceptible, but gradually increasing until it dashed majestically into the water. The baptismal rites on the occasion were gracefully performed by Miss Cristall, of Rotherhithe, amidst the cheers of the assembled spectators. When the vessel was brought up, she was taken in tow by a steam tug to the wharf of the Messrs. Penn, at Deptford, where she will be fitted with 123-horse oscillating engines.

Among the company present were, M. Zulueta, Capt. Capader, and other agents of the Spanish Government, several directors of the Woolwich Steam-packet Company, and other gentlemen connected with shipping.

THE PANOPTICON.

It will be a source of real gratification to the friends of the promotion of science in this country, to know that the internal arrangements of this noble Institution are rapidly and satisfactorily progressing under the judicious direction of Mr. E. M. Clarke. The magnificent interior, which will now, in the course of a few short months, become the scene of intellectual entertainments, and another great centre from which will emanate the rich gifts of knowledge, is now in a far-advanced state of preparation, and about seventy men are engaged upon it exclusively. In the beautiful cupola which surmounts it, experiments are being carried on with the view of determining the particular style of colouring and general ornamentation best suited to its elegant architecture. In a chamber opening into the first gallery, opposite to the main entrance, and only separated from the gallery by a large screen, upon which dissolving views and other optical demonstrations will be projected, a huge organ is now being erected, of dimensions even greater than the magnificent structure, to the pealing tones of which the Town-hall, at Birmingham, has so often resounded. This organ, too, is the work of the same builders, Messrs. Willis, of the Tottenham Court-road.

In the vast crypt, or basement storey, preparations are being made to receive a great quantity of ponderous machinery, for the working of which the place affords peculiar facilities. One feature of the Institution is particularly worthy of attention, as it affords the means which have long been needed of performing experiments on railway machinery, the speed of engines, the resistance of the atmosphere, &c., &c., which at present can only be tried on existing lines by the favour of directors, and even then by deranging to some extent the traffic of the railway, and perhaps endangering the safety of the experimentalists. Around the basement storey a circular line of rails is laid, of the gauge common in actual practice, so that a carriage or train of carriages can be worked upon it at any required speed with perfect convenience. In addition to other great works going on here, is an electrifying machine of the flat construction, the largest, we believe, ever made. The plate has been made by the Thames

Plate Glass Company, and is about 8 feet in diameter. The conductors also are of very large dimensions, and the arrangements for working the plates well proportioned to the electrical energy which the machine when finished will develop. This work is going on in a spacious chamber, which will hereafter be used as a chemical laboratory. The theatres for the delivery of lectures are spacious and well designed for public convenience. From the galleries of the interior, its architectural effect to the eye is remarkably fine.

Although the extension and cultivation of natural philosophy, and the greater of the arts of life are the main objects of this institution, Mr. Clarke has rendered it subservient, with praiseworthy philanthropy, to the accomplishment of others of a highly moral and social character, the gradual fulfilment of which will, we trust, acquire force from the example which he intends to set. One rule of the Institution will be that every holder of a stall or standing for the exhibition of machinery or manufactured produce will be required to be present, either in person or by others, to work the machines, explain their construction and operation to the public, or point out the superior qualities of new productions. And of the persons who will be selected for this purpose, the preference will be given, wherever it is practicable, to young women; thus giving them a respectable standing in society, and affording an additional source for their employment, of which at present they enjoy but few. The merits of this arrangement it is quite needless to point out, and upon the whole, we are disposed to look forward with high expectations to the results of an institution like this, belonging to a class which we are glad to see recognised by the public with increasing favour.

LIFE BOATS.—EMERY.—RAINBOWS.

Sir,—Two of Beeching's Prize Life Boats are reported to have capsized, and not to have "righted themselves" again.

These boats, like all others, must be, of course "capsizable" by some certain amount of pressure.

It appears pretty plain, that the limit of this pressure was wilfully exceeded in both the instances referred to, and thus we have no difficulty in accounting for the upsetting of the boats.

Life-boats built according to Beeching's plan, had been repeatedly turned bottom upwards during the competition for the Northumberland Prize, and they invariably (as did many others) righted and freed themselves when relieved from the pressure intentionally applied to them. But in no case of the trials respecting these various life-boats have we heard of their being purposely upset *with sails set;* and as it is well known that life-boats are liable to be swamped by squalls when under sail, not less than to be capsized by the waves when propelled only by oars, some attention should be given to this part of the subject.

Take a model boat—a child's toy ship, —and turn it bottom uppermost, without sails, and then, with mast, rigging and canvas, and the cause of the failure of Beeching's boats to right themselves will be evident in a moment.

The obstacle which a sail presents to the righting of a boat is the more powerful when that sail is a "lug," and is also increased in the case of life-boats, by the fact that they are scarcely even upset when under sail, except when close-hauled; under which circumstances the sail, when below water, is in the worst position for permitting the boat to recover her upright position.

Seeing then that a boat which will "right herself," if upset without a sail, will not do so if a sail has been set before she was capsized, we must either forego the use of sails altogether (certainly within narrow limits) in life-boats, or sacrifice some of their other properties to increase the stability and "righting" powers.

Perhaps, however, since it is probable that men will continue to use sails in life-boats, and to capsize them when under sail, our attention should be directed to diminishing, as far as possible, the obstruction presented by a sail to the "righting" of a boat capsized; and I would desire to stimulate the ingenuity of your readers upon the subject, the problem being "How to get rid of the sail when the boat is upset." No other suggestion occurs to me at present than to suspend the sail, not by a sheave *in*, nor by a block fastened *round* the mast, but by an iron loop hung upon a centre-

pin, say 6 inches long, and projecting from the top of the mast.

In the case of a lug-sail, it is probable that by such an arrangement, when the mast is inverted under water, the haliard block would slip off, and thus get free of the boat.

Emery.

In No. 1514 of your Magazine, is an article upon "Emery," in which is described the composition of "strop-paper." Perhaps the following plan for sharpening razors is unknown to your readers. Wipe the razor every day (immediately after shaving), with a piece of paper taken from one of the common "metallic memorandum"-books, and it will not require any other sharpening for many months. I found this useful to know when travelling where razor-strops are unknown, and when I had lost mine.

Rainbows.

I was somewhat surprized, about three weeks ago, to observe in Ireland, on a showery day, not only a "primary" and "secondary," but even a third rainbow concentric with the others, but within the principle bow. The sun was very low at the time; the colours were, I think, as in the secondary bow. Can any of your correspondents give a clear explanation of this, by setting forth the several reflections and refractions which a pencil would pass through in entering a globule of water, so as to produce *three* rainbows?

Yours, &c.,
JOHN MACGREGOR.

Temple, October 11, 1852.

PROGRESS OF THE CRYSTAL PALACE WORKS.

The work of reconstruction at Penge-park is rapidly advancing with the energy and promtitude of the contractors, and the excellence of the general arrangements of the Directors of the Company. In the very short space of time which has elapsed since the 5th of August, when the first column was raised, and though the extreme inequality of the ground has occasioned an enormous amount of preparatory labour in the adjustment of the level, an inconceivable quantity of work has been got through. Already the stately rows of shafts which constitute the substantial part of this airy architecture, present themselves in dense masses at a considerable elevation, and to travellers on the railway, which passes along the bottom of the grounds, appear projected against the sky in grand prespective.

The rapid fall of the ground towards the railway, amounting to 200 feet difference of level, has very much retarded the progress of the work. A base of solid concrete is here only in a very few places a sufficient preparation to receive the dwarf castings. In most instances, columns of masonry, varying in height from 1 foot to 6 feet, and sometimes more, are built upon the concrete, and upon the summits of these come the castings which carry the shafts. The roof water-pipes will run transversely to this building, and not longitudinally as in the old one; and from this circumstance also new castings of smaller kind have become necessary. Constant arrivals of them are taking place, and they are fixed in their respective positions with all the extreme accuracy which distinguished the Hyde-park building, and by which alone so vast an undertaking can be successfully prosecuted.

The ingenious proving-machine, by which the strength of every girder was tested before it was put up, has undergone a slight modification, which renders it more convenient for practice. This alteration consists in the reduction of the diameter of the indicator of the hydraulic press, and the adjustment of its lever and weight, so that a weight of one pound put into the scale, represents a proof pressure of one ton on each point of the proving-machine.

The following is the scale of proofs for girders of each class:

High-proof girders, 4½ tons on each point.

Ordinary gallery girders, 7½ tons on each point.

Strong gallery girders, 11¼ tons on each point.

Girders for 4½ in. arches, 9 tons on each point.

Longitudinal girders, 28 tons on each point.

Solid girders for 9 in. arches, 33 tons on each point.

The last-mentioned girders are magnificent castings, averaging in weight 1 ton 11 cwt., and are intended to carry the basement on the eastern side of the building, as the exhibition of machinery will be arranged in this place, and an additional storey of superstructure is to be borne, the importance of these solid girders will be perceived. Their proof strength is sixty-six tons on the two points, which is equivalent to about eighty-eight tons equally distributed over their length.

Internal Arrangement.

The distribution of objects of fine art and manufacture in the new Crystal Palace at Sydenham will be as follows:—Entering the building in the centre of the basement on the eastern side, and ascending to the ground floor, four large courts of 72 feet by 48, extend along the nave northward and southward. The first, towards the north, is the Italian and revived classical court, in which will be exhibited a fine collection of statues, vases, and other classical subjects. Further on, towards the north, is the second court, containing English, French, and Flemish art-manufactures of the *renaissance* period, in which a central tomb and statues will also occupy a conspicuous place. The next court northward is the mediæval court, which will be furnished with appropriately designed cloisters. In this court there will be several tombs and fonts of a remote period, a collection of the great seals of England, and some cases of French ivories and enamels. The Byzantine court is the next and last court in that direction, and will contain specimens of Byzantine, Romanesque, and Norman art. Fonts and sculptured figures, mosaic tombs and statues, will also be prominent here. On the left of the same entrance from the basement, the arrangements include the exhibition of silks, shawls, and lace, in one court; of woollen goods in the second; of flax and hemp in the third; and of printed fabrics in the fourth.

Entering the ground floor from the west, we have the Nineveh and Egyptian courts immediately on our left, and occupying together a space equal to twenty-one squares of twenty-four feet each way. The bulls and lions of Layard's Nineveh, and an ample collection of Egyptian antiquities will be displayed here. Next to this court, still proceeding northwards, is the Greek court, in which some fine bas-reliefs will be shown, a large model of the Parthenon, and classified specimens of early and late Greek vases. A court devoted to Roman antiquities is the next; and then follows a Moorish court, in the style of the Alhambra, which will include the "Alhambra refreshment room," the Hall of Justice, and the Court of Lions, with its fountain.

On the southern or right-hand side of the western entrance, are courts for the exhibition of furniture, carpets, paper-hangings, bookbinding, stationery and fancy goods, and Birmingham and Sheffield wares. Southward of all these, in the same direction, a rectangle, equal in area to twelve squares of twenty-four feet each, is applied to the formation of summer apartments on the classical model. We found in it a *triclinium* refreshment room, a *tablinum*, a *compluvium*, and several little *cubicula*, all of which, no doubt, will be very inviting on the return of hot weather.

The gallery arrangements are also very extensive. Ascending by the eastern staircases, and proceeding northward, we find very considerable spaces devoted to the display of the precious metals, articles of clothing, and unclassed objects. Proceeding southwards from the same staircases, we come to a series of long tables, on which will be exhibited every variety of substance used for human food; and to the musical instruments. Entering the gallery by the staircases on the west, the central portion is filled with China and glass. On the north side we find leather, fur, and sundries; on the southern, musical and philosophical instruments; and in the extreme southern gallery the cutlery. Several open galleries, partly separated from the great lines of counter, occur at frequent intervals, and pleasingly vary the general arrangements. On the ground-floor, too, there are some open corridors of enormous length, which will have an exceedingly elegant appearance. Along the great central nave will be a variety of works of art, as in the old Exhibition. These will include an Egyptian obelisk and a Greek column.

A considerable space on the ground floors will be tastefully laid out as a garden, in which trees indigenous to many countries will be shown, together with a great number of birds. The basement will contain Sir Joseph Paxton's tunnel, running the entire length of the building. Here also will be arranged all the machinery sent for the exhibition.

There will be a large central and two side entrances in the basement, an entrance in the north and another in the south side of the ground floors, and three on the western. Considering the general scope of the undertaking, it is scarcely possible that a more desirable distribution of parts could have been devised, either with reference to public convenience, enjoyment, or to those purposes of instruction and study which the place so eminently conduces to. The plans have been beautifully executed in colours, by Messrs. Day and Son.

SUBMARINE TELEGRAPHS.

It is now more than a year since the first great experiment in submarine telegraphic communication was made between Dover and Calais. Although the electric current was made to traverse the depths of the ocean, and the end was thus attained, it was evident that the

enterprise was little more than tentative, and that much remained to be *worked out*, before the requisite facility and economy could be imparted to this mode of linking shore to shore in instantaneous communication. What has since occurred at Holyhead and at Dublin confirms the truth of our observation. A rope was laid down in the course of last summer—one or two messages transmitted across St. George's Channel, and then there was an ominous pause. The scheme, in short, proved for the time abortive. The Submarine Telegraph does not therefore make the progress that was anticipated, and we suspect this is owing to the want of a proper principle at the outset, as regards the construction of the rope and other details. The rope used between Dublin and Holyhead was on the principle of twisted wire. Now a rope constructed after this fashion might be well adapted for certain purposes, for *traction* and so forth; but it does not follow that it would be suited to the very particular requirements of a submarine telegragh. At all events, both ends of the rope have been lost, and the *disjecta membra* lie at the bottom of the Channel—find them who may. A succeeding attempt was made between Portpatrick and Donaghadee. Here, we believe, the rope was on a different plan, being made entirely of hemp. According to the journals, the anchor of some skipper, who little dreamt of submarine telegraphing, came in contact with the rope, and thinking it a good windfall, secured exactly 472 yards. The extent of the worthy skipper's prize is given with great precision, but we confess ourselves somewhat sceptical on the subject, and rather fear that a screw was loose in a totally different quarter. Be that as it may, this rope, like the Dublin and Holyhead, has proved a failure. But to give a double chance, we learn that another rope was preparing for Portpatrick, on the same twisted principle to which we have already adverted. This was to have been submerged two months since, but has not yet been tried.

We would humbly think that those delays and mishaps might have induced a pause to consider whether the parties were proceeding on the right principle as regards the construction of the rope on which the whole efficiency and permanence of the system depend. But it is still stated that a rope on this principle was to be laid down from Dover to Ostend on the 11th ult., to be succeeded by a still longer stretch from Harwich to the Hague. We still await the performance of this experiment. As short days and stormy seasons are not the best adapted for such undertakings, we should not be surprised if the Spring overtake us ere those projected communications are secured. Before that period, and whether these ropes are laid down or not, those interested in the extension of the submarine telegraph may find cause to adopt a different test. In any view, there is here ample range for invention, as we do not expect any decided success from the attempts now in progress.

THE OCEAN TELEGRAPH COMPANY.

The connection of the telegraphic lines of the American continent with those of this country, by means of a submarine circuit, is an object which the engineering skill of the present day may legitimately be ambitious of accomplishing, when its perfect feasibility has been amply demonstrated in the successful working of the Irish and French lines. It is in the completion and energetic working of this stupendous undertaking that the world must look for the full development of commerce and industry, and for that perfect reciprocity of friendly relations which are so eminently conducive to the welfare and happiness of mankind. But, apart from the obvious advantages to society all over the world, which must flow from the establishment of this grand chain of intercommunication, in the absence of which we cannot consider ourselves to have made the utmost use of the intellectual and physical gifts which Providence has bestowed upon us—apart from all considerations of this nature, we are prompted to the undertaking by the lucrative prospects which it bears. The enormous scale of traffic now existing between the old and the new hemispheres must provide business for this telegraph, of the extent of which it would be difficult to form an idea, while the fresh impetus that would be given to all commercial and industrial operations on either side the Atlantic

would again re-act favourably upon it, and each would thus mutually support and extend the other.

Returning, however, from the pleasing speculations into which the project tempts us, and approaching the consideration of the means by which this vast work is to be performed, we are glad to find that all the great preliminary steps have been reduced to something like maturity by the labours of the promoters of the "Ocean Telegraph Company." Combination, which has done so much for man already, will certainly do this for him one day; and, having regard to the substantial and almost perfected schemes of the projected body we are alluding to, we cannot but conceive that their operations will be successful when the moment of operation arrives, and that before long the world may congratulate itself on the perfect realization of these ideas.

The little book in which the promoters of this Company detail the nature of the work, and discuss its practicability, is replete with instruction on every point of the undertaking, and shows most satisfactorily that the project has not been launched crudely upon the world without preliminary and extensive research, and without having first used a proper amount of effort to obtain the co-operation and assistance of all the Governments with whom it would be necessary to negociate. This ground has been gone over with results as satisfactory and as promising as have attended the consideration of the scientific and engineering details of the subject. At present, the project assumes the following form: The Telegraph will leave the mainland of Great Britain at the same convenient point on the extreme coast of the county of Caithness, and proceed thence to the Orkneys, with a station at Kirkwall. A second submarine line will extend to Shetland, where it is proposed to have a station at Lerwick. From Shetland a long submarine telegraph will proceed to the Ferroe Islands, with a station at Shorshaven, and from Shorshaven another submarine line will go to Reikiavik, on the south-eastern coast of Iceland. A land telegraph will carry the line through the interior of this large island to the opposite promontory of Sneefelds, and again resorting to the submarine system, the eastern coast of Greenland is reached near Graah's Island, in latitude 65°. The telegraph will be brought along the coast of Greenland underground to the Danish colony of Juliana's Hope, not far from Cape Farewell on the Baffin's Bay side, and crossing Davis' Straits by another, and the last submarine line, a station will be reached on the coast of Labrador, where some convenient English factory, such as Byron's Bay, will be selected. From this place the last great land section of the line will unite with the American system of telegraphs at Quebec, the terminus of an enormous network of upwards of 22,000 miles. Thus will London be placed in immediate electro-telegraphic communication with the States of the Union, our West India possessions, California, and the Pacific. As regards the merits of this project, it is only necessary to point out that they are reducible to the following principal heads. The line will have the advantage of shortness, its entire length being estimated at 2,500 miles. As the submarine portion of the line, which, altogether, is one-third less than the direct course, is not in one entire piece, damage done at one particular spot will not involve the ruin of the whole, but will apply only to the particular section in which it occurs. By the course adopted, the enormous beds of fuci, which, according to Humboldt, cover a surface of 260,000 square miles, and extend to 45° of north latitude, are completely avoided, and the obstacle removed which they would otherwise present to the submersion of the line. Along this line, too, the soundings are highly favourable, and upon the whole, the project reflects great credit upon the ingenuity of its promoters, Messrs. C. W. and J. J. Harrison. Their exertions, too, by negociation with the Danish and Canadian Governments, and by consulting all authorities on Iceland, Greenland, and Canada, with reference to the permanent security of the land sections of the line through those countries, have imparted to the whole project an aspect of promise, which assures of its speedy incorporation by Royal charter, which we shall be among the first to hail with satisfaction.

NOONE AND EXALL'S SPRING CARRIAGE HEAD.

(Registered under the Designs Act.)

Fig. 1.

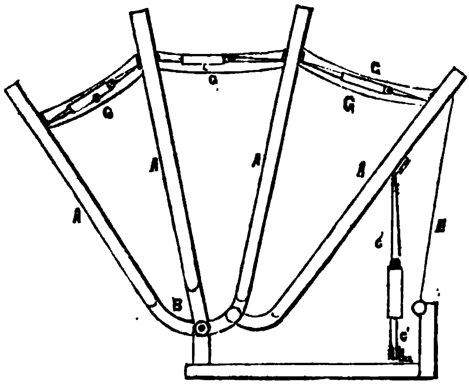


Fig. 2.

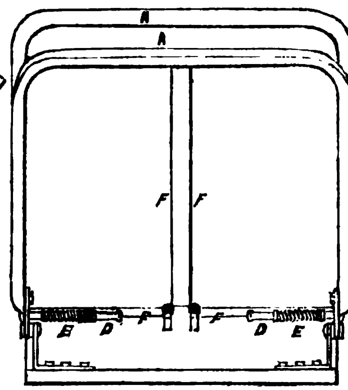


Fig. 3.

Fig. 1 is a side elevation, and fig. 2 a front elevation of this carriage head in an expanded state. AA are the hoop sticks; BB, the neck plates on which they are hinged; CC are the head springs, which are of the peculiar shape represented in fig. 3, where *a* *a′* are the two arms, which are jointed at *b*; *c*, a helical spring, fitted upon the arm *a*, and *d*, a metal strap jointed to the arm *a′*, in such manner, that when the arms are folded together the helical spring is compressed by the strap. By this arrangement, the helical spring keeps the arms either distended or folded up, according as it may desired to keep the head up or down. The head springs, joints and springs are covered with a vulcanized India-rubber tube. DD are moveable props, which support the head when folded; they are free to slide out and in to a certain extent. EE are helical springs, which cause the props to protrude when the head is down, but when the head is up, the props are drawn in by the cords, FF, so that they do not appear so prominently. GG are head-straps, one on each side, by pulling which, any portion of the head may be easily folded down by the occupants of the carriage without stopping for that purpose. The two back head-springs, C′ C′, fig. 1, have straps connected by staples, to the back springs, by which the head is struck, or folded, by simply pulling the straps through the roller staple at *a*.

TRIALS OF ANCHORS.

Woolwich, Sept. 15.—The Anchors originally tested at Woolwich with the usual proof strain, and subsequently experimented with at Sheerness to ascertain their holding powers and other qualities, were brought into the Anchor-testing room at Woolwich Dockyard, to be broken in the presence of several officers and scientific genetlemen.

The first anchor placed in the testing frame was one of Lieutenant Rodgers' patent anchors weighing 19 cwt. 8 lbs., the usual testing strain of that weight being 19¾ tons. On the 20 tons strain being applied, the deflection was a quarter of an inch, and it began to crack at 45 tons, and again at 68¼ tons, 70½, 71¾, 72, 73, and broke its shackle at 73½ tons, which completed its trial.

Mr. Mitcheson having declined to have his anchor broken, one of Messrs. Brown and Lennox's anchors, weighing 20 cwt. 3 qrs. 14 lbs., was placed in the frame, the usual proof strain being 21½ tons. On 20 being applied it deflected 1-16th of an inch,

and it cracked at 44½ tons, and broke at 47 tons, the shank being broke even across at 2 feet 4¾ inches from the crown.

Mr. Isaac's American anchor, weighing 21 cwt., 0 qrs. 14 lbs., was then placed in the frame, the usual proof strain being 21¾ tons. On 20 tons being applied it deflected 3-16ths of an inch, and cracked at 58 tons, and again at 61, 62, and broke at 63 in the shank, near the crown.

Mr. Trotman's anchor, weighing 21 cwt. 1 qr. 10 lbs., was next placed in the testing frame, and on 20 tons being applied, it deflected 11-16ths of an inch, and cracked at 51½, and again at 53, and broke at 53½ tons, in the shank, 2 feet 4 inches from the crown. It was not intended to break Mr. Honniball's (late Porter's) anchor, its principle being so similar to Trotman's, which was made as an improvement upon it; but in consequence of Trotman's being the first made on his plan, and the peak found to press too much on the shank, it was decided that Mr. Honiball's should be broken. On being placed in the testing frame, it began to crack on the application of 54 tons, again at 59½, 60½, 63, 66, and broke at 75½ at 2 feet 3½ inches from the pin in the crown. The upper arm broke at the same moment; a proof of the equal strength of both parts of the anchor.

The trial concluded at half-past four o'clock P.M., by breaking one of the Admiralty anchors, which began to crack at 40½, again at 48½, 50, 51½, 52½, 53½, 54, 54½, and the arm came out of the crown at 56½.

Sept. 16.—The breaking of Mr. Aylen's anchor took place this morning, when it deflected five-eighths of an inch on 20 tons strain being applied. It cracked at 44, and broke in the shank, near the crown, at 47½ tons.

The following gives at one view the final result of the experiments, the breaking of the anchors, and the time occupied in breaking each:

Anchors.	Weight.			Proof Strain.	First Crack.	Broke.	Time in Breaking.
	Cwt.	qr.	lbs.	Tons.	Tons.	Tons.	Minutes.
Lieutenant Rodgers's	19	0	8	19⅞	45	73½	21
Mitcheson's	21	0	0	21⅝	—	—	—
Brown and Lennox's..........	20	3	14	21⅛	44½	47	7
Isaacs's	21	0	14	21¾	58	63	10
Trotman's..................	21	1	10	21⅞	51	53½	18
Honiball's..................	20	3	7	21¼	54	75½	42
Admiralty's	20	2	6	21¼	40	56½	26
Aylen's	21	1	0	21¾	44	47½	6

PROFESSOR YOUNG'S RUDIMENTARY TREATISE ON ARITHMETIC.*

This book justifies its title; it is a remarkably clear and intelligible exposition of the *Science* of Arithmetic, and will prove equally acceptable both to the teacher and to the learner. It is evidently the result of much careful thought and much practical experience, and we think that many who may fancy that they know arithmetic will find it to their advantage to study the author's explanation of first principles. We are glad to find that he so unsparingly condemns the monstrosity of multiplying money by money, weight by weight, &c., and we hope that his remarks may help to weed out such nonsense from our systems of calculation. His articles on Decimals may be very profitably read, even by practised computers, and will be hailed by the school-boy as a means of relieving him from the superfluous drudgery to which other books compel him. As the price of the work is only one and sixpence, for nearly 200 pages of closely-printed matter, abounding with examples of striking interest, it cannot fail, if made generally known, to take the lead in our schools and among self-taught students. The promised key, however, will no doubt greatly add to the general circulation of the book.

* Rudimentary Treatise on Arithmetic, with full explanations of its Theoretical Principles, and numerous Examples for Practice: for the use of Schools, and for Self-instruction. By J. R. Young, late Professor of Mathematics, in Belfast College. John Weale, High Holborn.

ROPE-MAKING MADE EASY. BY T. DALBY IAGO.*

* F. and J. B. Philp, 2, Copthall-buildings.

This is a little book written with great sincerity of purpose, and directed to the accomplishment of a reform, by legislative enactments, of the footing upon which the rope-making trade at present proceeds. Undoubtedly, the importance of having ropes in which the utmost reliance can be placed is not to be exaggerated. Of the fatal consequences of deceptive cordage, and of the extent to which ropes of imperfect qualifications are introduced into the service of the commercial marine of this country, the author seems to have given abundant proof. He has made it his business to become familiar with the cultivation and treatment of hemp and of hemp-seed, and of the impositions which are extensively practised in the selection of the raw material, by allowing it to overgrow its proper maturity for the sake of nourishing the seed, and by other means. Not content, however, with merely indulging in the censoriousness which his convictions on these points have prompted, he shows clearly enough how the entire practice of rope-making may be reduced to a matter of the most simple arithmetical computation in the hands of an honest maker. The more important statistics of the rope trade will be found scattered throughout the pages, and occasionally employed in corroboration of his views respecting the tricks of the ropery, the history of which he incidentally sketches, from the time of Elizabeth to the present day. A great number of rules and examples in figures are calculated, accompanied with all requisite tables and data; and the book is made still more useful, in a legal point of view, by its setting forth a well-digested compendium of the Cordage Act.

THE CYCLOPÆDIA OF USEFUL ARTS. EDITED BY CHARLES TOMLINSON.—GEORGE VIRTUE.

The twenty-fifth Part of this admirable serial has just been published, and more than sustains the high name it has achieved for itself as a comprehensive and popular expositor of scientific subjects at the present period of their development. In this part is embraced a wide range of articles having the most important bearing on various of the decorative and ornamental arts, and others devoted directly to some of the most prominent of them. The copious and masterly article "On Light," which is here brought to a conclusion, has very properly been made to include a succinct, yet clear exposition of the theory and management of colours. The readers will find in it, beautifully condensed, the result of the intelligent labours of M. Cheoreal, as detailed in his large work, entitled "De la Loi du Contraste Simultané des Couleurs, et de l'Assortiment des Objets Colorés." This alone is sufficient to render the book invaluable in many of our manufactures, and we earnestly recommend every one to read it, who is in any way concerned with the mixing of colours artistically. Unless in the happy possession already of an educated eye, and an extremely refined taste, he will profit largely by studying it with care and attention. There are also two excellent articles on lighthouses and locks, which contain, within comparatively short limits, all that is worthy of notice in these subjects. The book is profusely illustrated with engravings on copper and wood, executed in the first style of art, and altogether is most interesting and instructive.

THE DUBLIN EXHIBITION.

A very interesting experiment has been performed at Messrs. Turners', Hammersmith Ironworks (who have the contract for the girders, under the superintendence of W. Fairbairn, Esq., of Manchester, the celebrated engineer). In order to ensure perfect safety, two of the wrought iron girders for supporting the galleries of the exhibition building was tested with a load of 32 tons, equally distributed over the surface; with this load they gave a deflection of 1 10-16 inches in the middle, and on removing it they restored themselves to within 10-16 of an inch of their original position, giving a permanent set to that amount. The estimated load it will ever be called upon to bear will be four tons on each girder, so that there is a margin of strength equal to four times the greater load.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING OCTOBER 18, 1852.

WILLIAM WATSON PATTINSON, of Felling New House, Gateshead, manufacturing chemist. *For improvements in the manufacture of chlorine.* Patent dated April 6, 1852.

In the specification of a former patent, granted to Mr. Pattinson, July 14, 1846, he described an apparatus for producing chlorine from peroxide of manganese and muriatic acid, in which a stone still or vessel was used, enclosed in a double iron vessel, which was heated by steam circulating between the double sides. This apparatus, however, is liable to be entirely deranged, and the iron vessel destroyed by the muriatic acid, if the stone still should happen to get broken; and it is to obviate this inconvenience, by enabling the still to be worked, although in a broken condition, that is the subject of the present improvement. This Mr. Pattinson proposes to do by perforating the inner iron vessel, and filling the space between the two iron vessels, and between the inner iron vessel and the stone still with coal tar or pitch, thickened by boiling to such a consistence as to be tough, but not brittle, when cold. This tar is kept in a heated state, by means of steam circulating through a pipe coiled between the iron vessels, and in the event of a breakage of the stone vessel, it flows into the fissure, and prevents the escape of the muriatic acid into the iron vessel. The distillation of the chlorine is effected by means of steam, under pressure, admitted to the interior of the stone still, as described in the former specification above referred to.

Claim. — The surrounding a stone or earthenware still or vessel, with coal tar or other suitable material, for the purpose and in the manner described above, when used for the manufacture of chlorine.

FRANCOIS JOSEPH BELTZUNG, of Paris, engineer. *For improvements in the manufacture of bottles and jars of glass, clay, gutta percha, or other plastic material, and caps and stoppers for the same, and in machinery for pressing and moulding the saidmaterials.* Patent dated April 15, 1852.

These improvements consist in manufacturing bottles and jars, having inscriptions, devices or screw threads formed on the necks thereof, and also caps and stoppers by the employment of dies and pressure. The arrangements by which these objects are effected constitute the subject matter of the claims.

CHARLES WILLIAM SIEMENS, of Birmingham, engineer. *For an improved fluid meter.* Patent dated April 15, 1852.

Mr. Siemens describes several improved constructions of meters, but they are all distinguished by the same principal feature, which is the employment of a screw or screws revolving in a cylinder in combination with fixed guides or plates, by which the water is deflected against the screws, which, by their revolution, give motion to counting apparatus, and thereby indicate on a dial-plate the quantity of water passed through the apparatus.

THOMAS ELLWOOD HORTON, of Priors Lee Hall, Salop, iron-master, and ELISHA WYLDE, of Birmingham, engineer. *For improvements in apparatus for heating and evaporating.* Patent dated April 15, 1852.

The patentees describe and claim—

1. A steam boiler of a peculiar construction.

2. An apparatus for heating the tubes of hot-air furnaces by means of steam, or superheated steam.

3. An apparatus for heating core stoves by means of steam, or superheated steam.

4. An apparatus for heating colours, varnishes, oils, worts, confectionery, &c.

EDWIN PETTITT, of Kingsland, civil engineer, and JAMES FORSYTH, of Cald-beck, Cumberland, spinner. *For improvements in machinery for twisting, drawing, doubling and spinning of cotton, wool, silk, flax and other fibrous substances.* Patent dated April 15, 1852.

1. The patentees propose to effect the drawing or elongation of yarns, twisted slivers or rovings, by the employment of drawing rollers, in combination with what they term "tubular grip flies," which hold the yarns or twisted slivers under operation intermediate of the alternate drawing rollers, and by revolving in a contrary direction to the twist, remove the same temporarily to such an extent as to admit of the drawing or elongating operation being effected. The twist being only temporarily or "provisionally" (as the patentees call it), removed, is still in existence in the drawn yarn which issues from the machine with the same extent of twist as it possessed on entering.

2. It is proposed to construct the grip flies with their holding surfaces set in rotation by means of revolving discs, so as to cause them to perform simultaneously the double operations of untwisting the yarn or twisted sliver, and drawing or elongating it.

3. The patentees combine with machinery acting as described, flyers, by which the twisted threads or yarns are at once doubled into perfect threads on issuing from the drawing rollers.—Claims as above.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For improvements for preventing the incrustation*

of steam boilers, which invention is also applicable to the preservation of metals and wood. (A communication.) Patent dated April 15, 1852.

This invention consists in the production of a compound designated by the inventor "Sibbald's Metalline Compound," and in the application of the same to the prevention or removal of incrustation in steam boilers, and to the protection of wood and iron-work of all kinds exposed to the action of water.

The compound is produced by diffusing in one pound of melted tallow or grease, one pound of finely powdered graphite or black lead, and one-eighth of a pound of pulverized charcoal, with the addition, where additional fluidity is desirable, of one gill of oil or gas-tar to the above-named quantities of ingredients. The composition to be applied in a heated state with a brush in the same manner as paint.

The patentee states that the above-mentioned materials and proportions of the same have been found to answer well in practice, but he claims the right to use any equivalents therefore, or the materials themselves above mentioned, and that in any proportions that will produce substantially the compound as specified and designated "Sibbald's Metalline Compound;" and he also claims the application of the same in manner and for the purposes set forth.

SIMON DAVEY, of Rouen, France, merchant, and ADOLPHE LUDOVIC CHANU, of Paris, France, merchant. *For improvements in explosive compounds and fuses, and also in methods of firing the same.* Patent dated April 15, 1852.

1. *Explosive Compounds.*—Two such are specified; the first is formed of six parts of chlorate of potash, five parts of nitrate of potash, five parts of sulphur of antimony, two parts of yellow prussiate of potash, and two parts of bichromate of potash; the second is formed of six parts of chlorate of potash, three parts of nitrate of potash, three parts of sulphuret of antimony, and four parts of prussiate of potash. Each of these ingredients is separately and carefully ground to a fine powder, and the whole of them, when thus ground, are thoroughly mixed together. The compounds are then ready for use.

2. *Fuses.*—The improvements consist in manufacturing the same with an interior thread or threads saturated with an explosive composition, in lieu of the train of granulated gunpowder ordinarily used, by which means any possibility of a division in the centre of communication is effectually guarded against. By employing different compositions for saturating the threads, the time of burning of the fuses may be regulated, and slow or quick-burning fuses produced.

For slow-burning fuses, such as used by miners, and for ordinary blasting operations, the thread or threads are merely saturated with gunpowder, or its component parts, ground to a paste with thin gum-water.

To produce a quick-burning fuse, suitable for military operations, one or other of the explosive compounds before mentioned is used, or any other explosive mixture, ground to a paste with thin gum-water.

To prepare threads for being used in this manufacture, they are first immersed in a thin paste of the explosive mixture, and are then placed on swifts, and drawn through a thicker paste of the same compound, by which the saturation is completed and their exterior slightly covered. When quite dry, they are wound on bobbins, and wrought into the centre of fuses in the manner described in the specification of Bickford's Patent of 8th Sept., 1831.

3. *Firing Explosive Compounds.*—For this purpose, the patentees employ an apparatus, tube, or holder, containing a compound of a highly explosive nature (such as used in the manufacture of fireworks, or the second compound above mentioned), inserted in the body of the charge to be fired, and connected with a safety fuse, by which fire is communicated to the explosive compound in the cap, which, by its ignition, fires the charge, producing gas of a more explosive nature, and a more complete expansion than is obtained by the methods now in use.

Claims.—1. The explosive compositions described, and the employment of the same in the manufacture of fuses according to this invention.

2. The manufacture of fuses with an internal thread or threads of fibrous material, saturated with an explosive compound for communicating fire to the charge.

3. As the improvements in firing explosive compounds, the employment of a tube or holder containing a compound of an explosive nature, ignited by means of a fuse, and inserted in the body of the explosive compound to be fired.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For improvements in the manufacture of lenses.* (A communication.) Patent dated April 17, 1852.

These improvements have relation to the manufacture of what are known as "dioptric lenses," and consist in forming the same of glass moulded by pressure in metallic moulds. The lenses may be in one single piece, or built up of several concentric zones as heretofore.

Claim. — The manufacture of dioptric lenses in glass in one or more pieces by pressure in metallic moulds.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in machinery or apparatus for cutting paper, pasteboard, or other similar substances.* (A communication.) Patent dated April 17, 1852.

The *first* machine described by the patententee, which is intended for cutting paper for bookwork, is distinguished from others of its class by the employment of a moveable table, on which the paper to be cut is piled and held by a sliding clamp or clamps, while the table itself is raised so as to bring the paper on it under the action of the cutting blade, which has a reciprocating horizontal motion.

The *second* machine, which is for cutting pasteboard, has a permanently fixed table, on to which the pasteboard is held by a clamp, and gradually fed forward to be cut between a stationary knife at one edge of the table, and a second vibratory knife, which is moveable vertically above the fixed one, but has its edge inclined at an angle to it, so as to give a shearing cut.

Claims.—1. The arrangement of the moveable platform and sliding clamps, and the employment of those parts in combination with a vibrating knife.

2. The arrangement of the platform or table, and the carriage or feeding motion with the moveable clamp for clamping the pasteboard on to the platform, and the combination with these parts of the stationary and moveable shears.

JOHN GILLETT, of Brails, near Shipston-on-Stour, Warwick, agricultural implement maker. *For certain improvements in ploughs.* Patent dated April 17, 1852.

In order to break up the track made by the horses in dragging forward a plough, Mr. Gillett proposes to employ an additional forward share placed at such a depth as to act on the soil previous to the ordinary share coming into operation. And to admit of the share being raised and lowered to suit particular cases, and altogether clear of the ground when required, he hinges it to the frame, and applies a system of leverage by which it is brought under command of the ploughman.

Claims.—1. The application to turn-furrow ploughs of a forward share.

2. The mode of mounting the share so as to admit of its being raised clear of the ground when required.

HENRY GUSTAVE DELVIGNE, of Brixton, Surrey, gentleman. *For certain improvements in fire-arms, and in the methods of discharging the same; also improvements in projectiles.* Patent dated April 17, 1852.

1. Mr. Delvigne's improvements in fire-arms are shown as applied to pistols only, but are applicable also to other fire-arms.

Two forms of pistols are described; the first of these loads at the breech, and has a stock somewhat the shape of a saw-handle, but without the recess for the hand. The barrel is altogether above the stock, and is sustained on pivots at about the middle of its length, so that it may be raised at the breech end to admit of the cartridge being introduced. The barrel is then lowered to the stock, and a plug screwed in to close the end during the act of firing. The cap is placed on a nipple on the under side of the barrel, and the hammer is contained in the interior of the stock, a part of it projecting sufficiently to allow of its being cocked. The trigger is at the front of the stock, and is drawn by the pressure of the second finger.

The second pistol is of nearly the same form as the first, but loads in the ordinary way. The nipple is, however, at the breech of the piece, and this position of it enables the charge to be fired exactly at the centre. The hammer is arranged so as to strike the cap on the nipple in a line with the axis of the bore.

2. Mr. Delvigne proposes to form conical solid bullets with a stem or wire projecting at the rear end, the object being to prevent the crushing of the powder by the screw-plug when used in pistols such as firstly described—the plug bearing against the projecting wire instead of against the powder between it and the ball, which would be the case if not fitted with the projecting stem or wire.

Claims.—1. The general arrangement of the parts of pistols, and the application of the same, as far as applicable, to other fire-arms.

2. The construction of projectiles, as described.

HENRY STOTHERT, of Bath, engineer. *For improvements in the manufacture of manure.* (A communication.) Patent dated April 17, 1852.

These improvements consist in treating sewage-water with such a combination of materials as to cause the precipitation of the more substantive parts of the same; and in the manufacture of manure from urine.

The sewage-water to be treated is preferred to be received in underground tanks, and kept in constant agitation by suitable mechanical means, a quantity of fresh-burnt caustic lime being added from time to time as fresh quantities of sewage are run into the tanks. The patentee then adds to every 1,000 gallons

sulphate of alumina 10½ lbs., sulphate of protoxide of zinc half a pound, and compound animal and vegetable charcoal 10½ lbs., and, after stirring, and allowing time for the more solid matters to subside, he draws off the supernatant liquid, which may be applied as a liquid manure, with the addition, when intended to be preserved, of one drop of creosote or oil of peat to the gallon. The solid may be dried and formed into blocks, or may have spent tanners' bark, peat, old mortar, or other materials mixed with it before being dried, by which that operation will be much facilitated. The compound animal and vegetable charcoal directed to be used is obtained by distilling night-soil, or the solid residuum obtained as above, with peat or tanners' bark.

When manufacturing manure from urine, the patentee takes it in a putrid state, and adds sufficient sulphate of alumina to neutralise its acidity, or nearly so. He then evaporates it to a pasty consistence, mixes it with spent tanners' bark or peat, and uses it in that state as manure, or moulds it into blocks.

Claims.—1. A combination of the materials described, to disinfect sewage-water, and to precipitate the more substantive parts thereof, and also the obtaining compound animal and vegetable charcoal by distilling the precipitated matter or night-soil.

2. The preparing urine for manure by treating it as described.

Clemence Augustus Kurtz, of Manchester, manufacturing chemist. *For an improvement in all preparations of every description of madder roots and ground madder in or from whatever country the same are produced; also of munjeet in the root and stem, from whatever country.* Patent dated April 17, 1852.

This invention consists in treating madder and munjeet with liquid preparations of substances capable of inducing fermentation.

In carrying the process into effect, the patentee proposes a liquid as follows:—He takes 20 lbs. of crushed malt, and boils it in 100 gallons of water for twenty to thirty minutes, then stops the boiling and adds about 45 lbs. of bran, stirs the whole together, and allows it to settle, after which he runs off the clear, and filters the remainder. To every sixty to sixty-five gallons of this preparation he adds 100 gallons of water, heated to such a degree as to make the temperature of the mixture about 112° Fahr., and then stirs in about 3 cwt. of madder or munjeet, stirring at intervals of 10 to 15 minutes, till a homogeneous mass is produced. In this state the mixture is allowed to remain until symptoms of fermentation present themselves, when they are to be checked by successive stirrings during a period of 15 to 18 hours. The prepared madder or munjeet is then filtered, pressed, dried, ground, and packed away for use.

Claim.—The mode of preparing madders and munjeet above described.

William Henry Dupre and Clement le Sueur, of Jersey. *For improvements in certain apparatus or apparatuses for preventing smoky chimneys, applicable to other purposes of ventilation.* Patent dated April 17, 1852.

These improvements consist,

1. In a peculiarly constructed windguard in which blades or sections of screws ranged round a conical frame are employed to reflect the wind, and produce such a current as to carry off the ascending smoke or vitiated air.

2. In an arrangement of ventilating valves, where glass or other transparent material is used to admit light, and a counterweight employed to retain the ventilator open to any required extent.

Specification Due but not Enrolled.

Charles Seely, of the city of Lincoln. *For improvements in the manufacture of flour.* Patent dated April 15, 1852.

NOTICES TO CORRESPONDENTS.

J. H.—A Search is being made through the English and Foreign Catalogues of the Great Exhibition for the machine for knitting watch-guards, respecting which you inquire. The result shall be communicated in our next Number.

Mr. John Lilwall.—Though we sympathize entirely in the efforts of the Early Closing Association to abridge the hours of labour in certain lines of business in the metropolis, and should be glad to see them become successful, we are obliged to decline the insertion of your letter on "Emigration and the Home Market," as being clearly without the scope of this Magazine.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 1, 1852.

1. Robert Adams. Improvements in ball cartridges.
2. George Henry Brockbank. Improvements in upright pianofortes.
3. Peter Spence. Improvements in obtaining power by steam.
4. James Hodgson. Improvements in constructing iron ships and vessels.
5. Joshua Smith. Improvements in table knives.
6. Moses Poole. Improvements in the manufacture of guns and pistols.
7. John Henry Gardner. Improvements in toilet tables.

9. George Green. Improvements in the manufacture of casks.
10. Freeman Roe. Improvements in valves and cocks.
11. Thomas Wood Gray. Improvements in cocks and valves.
12. Thomas Wood Gray. Improvements in steam engines.
13. Edward Lambert Hayward. Improvements in lock spindles.
14. Thomas Christy. Improvements in weaving hat plush, and other piled fabrics.
15. Joseph Barker. Improvements in fastenings.
16. Moses Poole. Improvements in the manufacture of telescope and other tubes.
17. Charles Henry Newton. Improvements in protecting electric telegraph wires.
18. Thomas Dickason Rotch. Improvements in treating peat, and in manufacturing fuel and other products therefrom.
19. Moses Poole. Improvements in moulding articles, when India-rubber combined with other materials are employed.
20. Charles Frederick Bielefeld. Improvements in constructing portable houses and buildings.
21. George Duncan and Arthur Hutton. Improvements in the manufacture of casks.
22. Henry Walker Wood. Improvements in the construction of ships and other vessels.
23. Jean Baptiste Lavanchy. Improvements in wind musical instruments where metal tongues are employed.
24. Moses Poole. Improvements in making covers for, and in binding, books and portfolios, and in making frames for pictures and glasses.
25. John Mackintosh. Improvements in regulating and governing the flow of fluids.
26. John Macintosh. Improvements in evaporation.
27. John Macintosh. Improvements in packing for steam engines and other machinery.
28. Moses Poole. Improvements in coating metal and other substances with a material not hitherto used for such purposes.
29. John Daniel Ebingre. Improvements in the manufacture of animal charcoal.
30. Moses Poole. Improvements in the manufacture of trunks, cartouch and other boxes, in knapsacks, pistol-holsters, dressing, writing, and other cases, and sword and other sheaths.
31. John Dunkin Lee. Improvements in covering railway trucks and other vehicles.
32. William Pym Flynn. Improvements in paddle-wheels.
33. Moses Poole. Improvements in the manufacture of pails, tubs, baths, buckets, measures, drinking and other vessels, basins, pitchers, and jugs, by the application of a material not hitherto used in such manufactures.
34. Robert Beart. Improvements in the manufacture of bricks and other articles through moulding orifices.
35. Thomas Huckvale. Improvements in instruments for adminstering medicine to horses and other animals.
36. James Hare. Improvements in expanding tables and in music stools.
37. Moses Poole. Improvements in covering and sheathing surfaces with a material not hitherto used for such purposes.
38. The Honourable William Erskine Cochrane. Improvements in unloading coals from ships or vessels.
39. Felix Abate, and John Julius Cléro de Clerville. Improvements in preparing, ornamenting, and printing on surfaces of metal and other substances.
40. Frederick Richard Holl. Improvements in watches and chronometers.
41. Joseph Barrens. Improvements in steam engine boilers.
42. Oswald Dodd Hedley. Improvements in getting coal and other minerals.
43. Moses Poole. Improvements in harness, and in horse and carriage furniture.
44. James Hodgson. Improvements in machinery for draining land.
45. Charles William Rowley Rickards. Improvements in tongs for screwing pipes and tubes.
46. James Stewart. Improvements in the action of pianofortes.
47. Stephen Perry. Improvements in inkstands or inkholders.
48. Edmund Morewood and George Rogers. Improvements in rolling metals.
49. Edmund Morewood and George Rogers. Improvements in coating metals.
50. Walter Henry Tucker. Certain improvements in locks (applicable to locks for all purposes), by which they can be made so as to combine increased and perfect security with simplicity and cheapness of construction.
51. Thomas Craddock. Certain improvements in the steam engine and the steam boiler.
52. Walter McLellan. Improvements in the manufacture of rivets and in working in metals.
53. Thomas Browne Dalziel. Improvements in the treatment or manufacture of textile fabrics or materials.
54. George Pearson Renshaw. Improvements in turn-tables and traverse-tables, and in apparatus connected therewith.
55. George Mumby. Improvements in the manufacture of envelopes, and the machinery, apparatus, or means to be employed therein.
56. John Finlay. Improvements in grates and fire-places, or apparatus for the generation of heat.
57. John Joseph Macdonnell. Certain improvements in the construction of railways.
59. Marcus Davis. Certain improvements in the manufacture of carriages, carts, military and other wagons, and wheels for locomotive and other purposes.
60. William Wolfe Bonney and Robert Archbutt. Improvements in machinery for raising a pile on linen, cotton, silk, or other fabrics.
61. John Baylis. Improvements in hatbands and armlets.
62. John Sayers. Improved arrangements for maintaining a level surface or level surfaces upon or in connection with bodies subject to a rocking motion.
63. John Fordham Stanford. Improved machinery and apparatus for manufacturing bricks, tiles, and similar building materials, which is hereby denominated "The Complete Brickmaker."
64. Henry Richardson Fanshawe. Certain improvements in shawls, scarfs, neckerchiefs, handkerchiefs, mantles, sails or sail-cloth, table-cloths and table-covers, napkins, and umbrella and parasol tops and covers, and in an improved loom for weaving, applicable especially to the said improvements, in respect to some of the said articles.
65. James Stocken. An improved plaster spatula.
66. George Holmes. Certain improvements in the manufacture or construction of coats, capes, and other upper garments of personal attire.
67. James Brown. An improved method of making ships' or other vessels' anchors.
69. William Moore, and William Harris. An improvement in repeating pistols and rifles.
70. Robert Lakin, and William Henry Rhodes. Improvements in machines for spinning and doubling cotton and other fibrous substances.
71. John Ambrose Coffey. Improvements in apparatus for performing various chemical and pharmaceutical operations, hereby denominated "Coffey's Improved Patent Esculapian Apparatus," parts whereof are applicable to steam boilers, steam and liquid gauges, stills, and syphons.
72. Edward Wilkins. Improvements in the distribution and application of water or other liquid manure to promote vegetation.
73. Edward Wilkins. Improvements in ruling and folding the leaves of account-books or other

books used for mercantile purposes, and in making entries therein, and delivering vouchers therefrom, with accuracy and dispatch.

74. Christopher Kingsford. Machinery for solidifying peat, coal, and other substances of a like nature.

75. Laurentius Mathias Eiler. An apparatus to release or separate carriages on railroads in case of accident, giving at the same time a signal of distress.

76. Christopher James Schofield. Improvements in machinery or apparatus for cutting the pile of fustians and other fabrics.

77. Stephen Soulby. Improvements in machinery for letter-press printing.

78. William Smith. Improvements in machinery or apparatus for cleaning currants, raisins, and other fruits or vegetable substances.

79. Henry Smith. Improvements in reaping machines.

80. Matthias Walker. An improved ash-pan or apparatus for taking up ashes and cinders and separating or sifting them.

81. Frederick Osbourn. A machine or apparatus for facilitating the manufacture of various kinds of garments or wearing apparel.

82. Henry Mortlock Ommanney. Improvements in certain parts of machinery for spinning cotton and other fibrous substances.

83. Henry Mortlock Ommanney. An improved furnace for melting of metals in crucibles.

84. Edwin Pettitt. Improvements in the manufacture of ammoniacal salts and manures.

85. Joseph Brandeis. Improvements in the manufacture of sugar and saccharine solutions.

86. David Dunne Kyle. An improved method of excavating and removing earth.

87. Robert Robertson Menzies. Improvements in the manufacture of carpets, and other fabrics.

88. George Holcroft. Certain improvements in steam engines.

89. James Nichols Marshall. An improved wheel for carriages and other vehicles.

90. John Aspinall. Improvements in evaporating cane juice and other liquids, and in apparatus for that purpose.

91. William Walker. Improvements in wheels for railway carriages, and in the mode or modes of manufacturing the same.

92. Thomas Lawes. Improvements in the manufacture of agricultural implements, or an improved agricultural implement.

93. Thomas Lawes. An improved quilt or coverlid.

94. Thomas Lawes. Improvements in generating steam.

95. William Oxley. Improvements in apparatus for heating and drying.

96. Henry Bridson. Improvements in machinery to facilitate the rinsing, washing, and cleansing of fabrics, which machinery is also applicable to certain operations in bleaching and dyeing.

97. John Macmillan Dunlop. Improvements in the manufacture of wheels for carriages.

98. Thomas Firth. Improvements in machinery for preparing to be spun, wool, mohair, flax, cotton, and other fibrous materials.

99. Robert Anderson Rust. Improvements in pianofortes.

100. William Potts. Improvements in sepulchral monuments.

101. Thomas Allen. Improvements in the application of carbonic acid gas to motive purposes.

102. George Rennie. An improved chain cable.

103. Charles Lungley. Improvements in ship building.

104. Martyn John Roberts. Improvements in the manufacture of oxides of zinc and tin.

105. Richard Archibald Brooman. Improvements in machines for cleaning knives.

106. Thomas Allen. Improvements in propelling.

107. Henry Columbus Hurry. An improved construction of fountain pen, or reservoir penholder.

108. Thomas Fearn. Certain improvements in ornamenting metallic surfaces and in machinery and apparatus to be employed therein.

109. William Austin, and William Sutherland. Improvements in ornamenting glass.

110. John Wright and Edwin Sturge. Improved machinery for the manufacture of envelopes.

111. John Remington and Zephaniah Deacon Berry. Improvements in gas meters or apparatus for measuring gas or other elastic fluids.

112. Hermann Turck. Improvements in packing goods.

113. Richard Haresyk. An improved preparation or composition of colouring matter to be used in washing or bleaching linen and other washable fabrics, and in the manufacture of paper and other substances.

114. George Jenkins. Improved means of obtaining motive power through an atmospheric engine, by facilitating the attainment of exhaustion by currents of caloric, the engine being worked by the pressure of the atmosphere.

115. Charles John Carr. Improvements in machinery for making bricks, and other similar articles.

116. William Bolivar Davis. Improvements in ships' buoys, life buoys, ships' tenders, and other similar articles.

117. John Wilson Fell. Improvements in preparing and spinning hemp and other fibrous materials, for the purpose of making ropes, twines, and other similar articles.

118. Alexander Stewart. Improvements in the manufacture or production of ornamental fabrics.

119. George Ennis. Improvements in gaffs and booms.

120. George Collier. Improvements in the manufacture of carpets and other fabrics.

121. John Lee Stevens. Improvements in furnaces.

122. Duncan Bruce. Improvements in rotary steam engines.

123. Richard Whytock. Improvements in the manufacture of fringes, and of pleat for these and other ornamental work.

124. Richard Husband Heighway. Improvements in paving roads and other surfaces.

125. Thomas Hunt. Improvements in fire-arms.

126. George Bell. Improvements in saturating canvas and other fabrics in order to render them buoyant and waterproof.

127. Robert W. Parker. A new or improved mode of giving rotary motion to a shaft of a circular saw, or other mechanical contrivance.

128. William Rogers. Improvements in studs, buttons, and other fasteners.

129. Joseph Cox. Improvements in the manufacture of gates and hurdles.

130. Isaac Westhorp. Improvements in grinding wheat and other grain.

135. Robert Griffiths. Improvements in apparatus for indicating the number of persons entering and the distance travelled in public or other conveyances and places, and for the prevention of fraud upon proprietors of public conveyances.

136. William George Nixey. Improvements in tills and other receptacles for money.

137. Arthur Jackson. Improvements in gas burners.

138. Richard Atkinson Peacock. An improved construction of culverts for sewers for the purposes of drainage.

139. William Lewis. Improvements in compounding medicines in the form of pills.

40. Thomas Robson. Improvements in apparatus for igniting signal and other lights.

141. Astley Paston Price. Improvements in the manufacture of citric and tartaric acids, and of certain salts of potash, soda, ammonia, lime, and baryta.

242. Henry Bernoulli Barlow. Improvements in the manufacture of cylinders for carding cotton and other fibrous substances.

143. John Lawrence Gardner. Improvements in bottles and other vessels for holding liquids.

144. William Seaton. Improvements in the construction of iron vessels, and in sheathing or covering the same.

145. Donald Nicoll. Improvements in mourning bands for the arm or hat.

146. Edwin Lewis Brundage. Improved machinery for forging nails, brads, and screw blanks.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

Professor Andrew Crestadoro. Certain improvements in impulsoria, or machinery for applying animal power to railways, waterways, and common roads, and to other mechanical purposes, part of which improvements relate to railway and other carriages, to buffers, springs, breaks, and chains, and in the propelling vessels across liquid elements. October 8.

WEEKLY LIST OF NEW ENGLISH PATENTS.

William Brown, of Heaton, near Bradford, York, mechanist, for certain improvements in machinery and apparatus for preparing and spinning wool, hair, flax, silk, and all other fibrous materials. October 18; six months.

Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman, for an improved mode of manufacturing railway chairs. (Being a communication.) October 19; six months.

Joseph Palin, of Liverpool, Lancaster, wholesale druggist, and Robert William Sievier, of Upper Holloway, Middlesex, for improvements in brewing; and also in the production of extracts or infusions for other purposes. October 19; six months.

William Edward Newton, of Chancery-lane, Middlesex, civil engineer, for improvements in machinery or apparatus for sewing. (Being a communication.) October 19; six months.

William Edward Newton, of Chancery-lane, Middlesex, civil engineer, for improvements in machinery or apparatus applicable to public carriages for ascertaining and registering the number of passengers who have travelled therein during a given period, and the distance each passenger has travelled. (Being a communication.) October 19; six months.

Edward Henry Jackson, of Titchfield-street, Soho, Middlesex, machinist, for certain improvements in producing artificial light, and also in producing motive power. October 21; six months.

Edward Brailsford Bright, of Liverpool, Secretary to the English and Irish Magnetic Telegraph Company; and Charles Tilston Bright, of Manchester, telegraphic engineer, for improvements in making telegraphic communications, and in instruments and apparatus employed therein and connected therewith. October 21; six months.

William Reid, of University-street, electric-telegraph engineer, for improvements in electric telegraphs. October 21; six months.

William Boggett, of St. Martin's-lane, Westminster, gentleman, and George Brooks Pettit, of Lisle-street, Westminster, gas-engineers, for improvements in obtaining and applying heat and light. October 21; six months.

John Charles Wilson, of the Redford Flax Factory, Thornton, near Kirkcaldy, of Fife, North Britain, civil engineer, for improvements in the machinery and processes employed in and for the manufacture of flax and other fibrous vegetable substances. October 21; six months.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Oct. 18	475	Charles F. Nicoll..	Threadneedle-street	.... Vest collar and fastening.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1525.] SATURDAY, OCTOBER 30, 1852. [Price 3*d*., Stamped 4*d*.

Edited by R. A. Brooman, 166, Fleet-street.

TROTMAN'S IMPROVED FOUNTAINS.

Fig. 1.

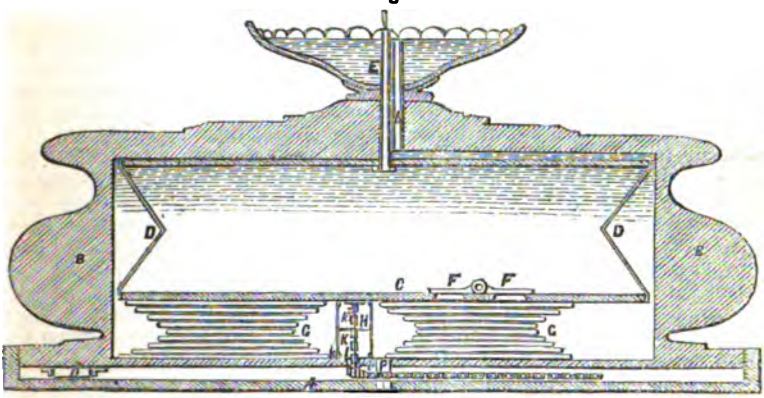
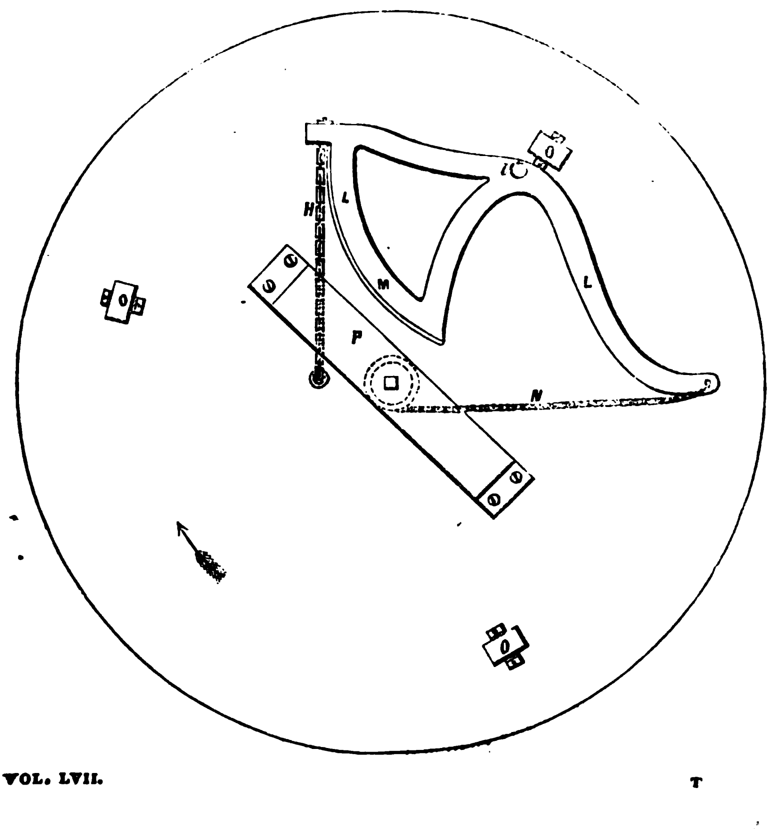


Fig. 2.



TROTMAN'S IMPROVED FOUNTAINS.

(Patent dated February 9, 1852. Specification enrolled August 9, 1852. See *ante*, p. 158.)

The improvements introduced by Mr. Trotman into the construction of fountains are exhibited in the accompanying engravings. Fig. 1 is a sectional elevation of the apparatus, in which A represents the plate or table upon which the fountain revolves, and B is the box, or main reservoir, containing also the working parts. These consist chiefly of an hydrostatic bellows formed by a valve-plate C, around which, and around the inferior side of the top of the chamber B, a casing of leather or other suitable material D is fastened. Water is admitted into the bellows through the valves F F in the plate C, and G G are helical springs, by means of which that plate is forced upwards. The valves, *f f*, closing by the resistance of the fluid within the bellows, the water is then expelled through the vertical tube E at the top of the apparatus. In order to bring the valve-plate C back, a chain H is attached to its under side, by the action of which water is re-admitted into the bellows through the valves F F, which yield to the pressure of the external water. The chain passes through an orifice, I, in the bottom of the chamber, and over a friction roller, *i*—the escape of the fluid at this point, and its contact with the chain, being prevented by surrounding the chain with a tubular piece of vulcanized India-rubber K, which is fastened at top to the bottom of the valve-plate, and at bottom around the orifice I. *k k*, are metal rings for this purpose, and k^2 is a third ring for the purpose of keeping the tube K distended. L, in fig. 2, is a bent lever, having for its fulcrum a pin *l*, which is attached to the under side of the casing B of the fountain. This lever moves in an horizontal plane on the inferior side of the bottom of the casing, which this figure shows. One end of it, M, is expanded into a circular arc, one quadrant in extent, and around this quadrant is brought the chain H, after it has passed over the friction-roller, *i*. The extreme end of this chain is secured to the beginning of the quadrant, in the manner shown in the figure. A second chain N is attached to the other end of the lever, and wound round the spindle P, which, together with the friction-rollers O O O, supports the fountain, and about which it turns.

This being the construction of the apparatus, its operation will be easily perceived. The springs G G being fully expanded, and, consequently, the valve-plate C being at its greatest height, water is poured into the chamber B through the tube *b*, until it is filled. By turning the casing round upon its pivot P, the lever L is moved by the coiling of the chain N upon its spindle. The effect is evidently to draw down the valve-plate C, and to compress the springs G G, which causes the valves F F to rise out of their seats, and the water immediately flows into the bellows under the pressure produced by the chain. When the valve-plate has completed its descent, this pressure ceases, and by releasing the apparatus the springs begin to restore themselves. In doing so, they press the valve-plate upwards; the valves F F now remain closed, and the water in the bellows is driven out through the jet E with a velocity proportioned to the power of the springs and the size of the orifice. On the top of the casing is an ornamental basin, which receives the water thus projected into the air, and from this it falls into the reservoir B through the tube *b*. By turning the casing B, so as to draw down the valve-plate C again, and so fill the bellows with the returned fluid, it is evident that the discharge of the fluid will be repeated under precisely the same circumstances as at first.

The inventor proposes also, wherever it shall be found desirable, to form the contractile portion of the bellows of vulcanized India-rubber, the elasticity of which, when the valve-plate was drawn down by the chain, would be sufficient to bring it back, and thus act as a substitute for the springs.

THE LONDON (WATFORD) SPRING WATER COMPANY.

The Provisional Directors of the London (Watford) Spring Water Company have made their Report to their Shareholders and to the public, which exhibits a highly satisfactory position of that great undertaking, in point of finance, of the weight of public favour, and of the preponderance of scientific evidence in its

behalf. After setting out very briefly, and only by way of retrospect, the state of the question before Parliament during the last session, the Report points out the peculiar circumstances which operated against its progress at that time, and their more promising aspect in the ensuing session. The Company refer with satisfaction to the evidence of the thirty-eight witnesses already examined, and which has been published in the Blue-book, as completely bearing out every pretension they have made of the superior qualities of the Watford chalk-springs water. They call attention likewise to the microscopical reports of Dr. Lankester and Dr. Redfern,—which they have also published, and a notice of which will be found below,—proving the existence of nineteen different species of living animals in Thames water, though taken above Teddington Lock, in pursuance of the Government measure for ensuring the purity of the supply. It appears, further, that the number of shares taken in the Company, and on which the deposit has been paid, is 12,387, and that the Directors will be able to return to the Shareholders, early in November, the surplus subscribed beyond 11s. 6d. per share.

The elaborate and ingenuous reports of Dr. Edwin Lankester and Dr. Peter Redfern, containing the results of their microscopical examinations of various waters taken from the Thames and other sources, and a third report on the chemical analyses of the Watford waters, instituted by Dr. Clarke and Dr. John Smith, of Aberdeen, are published in a separate pamphlet, under the authority of the Directors, to whom they were separately made. Considering the public experience of the impure qualities of the water supplied to the metropolis by the several companies,—remembering, too, what has appeared from time to time in the public prints of the results of private examinations of these waters,—the public will be prepared in some degree for the statements that are here made. But it is only in perusing the pages of these reports, and observing the extraordinary and multiplied forms in which, as the microscope discovers to the eye, animal and vegetable life becomes developed in these noxious fluids, that an adequate idea can be gained of the great aggregate of the mischief which is done to the human system by constantly imbibing the substances from which it is developed. Some of these hideous objects are represented in well-executed engravings, as they appeared under the action of powerful microscopes in the observations of Ehrenberg, Dijardin, and Hassall; and it is scarcely necessary to add that the mere sight of them should be a strong incentive towards procuring a radical reform in our system of supply. It will be seen that these reports give an irreparable condemnation to the water of the Thames above Teddington Lock, which is the principal security proposed by Government in the Metropolitan Water Act of last Session, and that it casts a reasonable degree of doubt on the efficiency of the other great precaution in the same measure, that of covering the reservoir. To attempt to sum up these reports is almost a superfluous work, as, besides being short themselves, they contain tabular expositions of the examinations of each class of water. As regards the Watford water, they establish its superior qualities for all domestic purposes, freedom from microscopical animation and vegetation, uniformity of the agreeable temperature of 52° Fahr., or 18° colder in summer and 18° warmer in winter than river water, perfect brilliancy notwithstanding heavy rains or long droughts, and susceptible, by a simple process, of being reduced from 17½° of hardness to 1½°—as soft as ordinary rain water, without loss of brilliancy and freshness. The chemical analyses are highly favourable.

From the introduction to these Reports we extract the following directions given by these gentlemen, to enable any experimentalist to operate upon similar specimens of water, with a view to verify the results here announced:

"A half-gallon stoppered bottle, well cleaned and steamed, should be filled with the water to be examined; the bottle should be held alternately before white and black surfaces in a good light, and the appearance of the fluid noted down. It must then be allowed to stand in a cool shady place for twelve or twenty-four hours, and on re-exmination as before, the living creatures visible to the naked eye will be discovered, and the character of the deposit ascertained. The animalcules visible to the naked eye are to be removed with a small glass tube used as a pipette, and if the deposit be considerable, successive portions of it must be abstracted

in the same manner also for microscopical examination. If the deposit be scarcely visible, the greater part of the supernatant fluid must be carefully removed with a syphon, and the deposit washed out into a wine-glass with the last one or two ounces of the fluid, from which it can then be removed in the same way as a more copious deposit. After being placed between two slips of glass, all the living animals and other structures named in the Tables can be shown by a good achromatic microscope, having powers of 250 and 500 linear diameters. Such an instrument, of French manufacture, can be obtained for from 4*l.* to 6*l.*, and the larger objects may be distinctly seen by glasses which may be procured for much less."

We have thought it desirable to call attention to the present state of the water-supply question, as disclosed in these Reports, not from any wish to promote the interests of the Watford Company in preference to those of any of its rivals, but from the conviction we entertain, in common with the public generally, that, under the most favourable circumstances that any Company could devise, the Thames is not a fit source from whence the supply should come. The Watford project has every appearance of being a step in the right direction, and as such, we feel a pleasure in assisting the spread of information concerning it.

THE CRAIG TELESCOPE ON WANDSWORTH COMMON.

(From the *Observer*.)

This magnificent instrument completely separates minute points of light. It resolves the Milky Way not simply into beautiful and brilliant star-dust, to use the language of astronomers, but subdivides this "dust" into regular constellations, showing counterparts of Orion, the Great Bear, and the other brilliant galaxies of our system. The lenses are so perfectly achromatic that the planet Saturn appears of milk-like whiteness; and, as regards this planet, a good deal of scientific interest has been recently attached to it, in consequence of the distinguished American astronomer, Bond, of the Cambridge Observatory, Massachusets, having stated that he believed he saw a third ring or belt round the planet. Professor Challis brought the Northumberland telescope at Cambridge to bear upon it, but failed in discovering it. Lord Rosse's gigantic telescope was also employed upon it in vain, and it became a matter of great interest to the astronomical world to ascertain whether there was a third ring or not; and this question has been solved by the Craig telescope,—the third ring, of a clear brilliant gray colour, having been distinctly seen. This is owing to the great quantity of light which the Wandsworth Telescope brings to the eye of the observer from this planet, giving a bright appearance to what, in an instrument of less power, would have been completely invisible.

Some idea of its powers may be formed from the fact that it magnifies the light of the moon 40,000 times, and in coarse objects, like the outlines of the lunar mountains and the craters, the whole of these rays may be allowed to pass at once to the focal point, as they do not in such objects confuse it in any appreciable degree. In the Craig Telescope the moon is a most magnificent object, and perfectly colourless, enabling the beholder to trace the outlines of the various mountain ranges with such vivid distinctness as to make us long for fine clear weather in order to bring the whole powers of this marvellous instrument to bear upon our satellite. It is positively asserted that on a favourable evening, if there was a building or object of the size of Westminster Abbey in the moon, the whole of its parts and proportions would be distinctly revealed. As an illustration of its space-penetrating powers, and the manner in which it grasps in the light, it may be stated that soon after it was erected it was directed to a test object, a minute speck of light in one of the constellations, which is not to be seen at all times by the most excellent instruments, though guided by first-rate observers, and in profound darkness. The Craig Telescope at once discovered that this test object was not a minute speck of light, but a brilliant double star. As soon as it is finally adjusted, Mr. Craig proposes to direct the instrument to the planet Venus, to examine it minutely, in the hope that he may be able to settle the question whether she has a satellite or not.

But wonderful as are the effects of this telescope, it is not yet perfect, and it has been found that a part of one of the lenses is too flat by about the five-thousandth part of an inch! To many it may appear incredible that the five-thousandth part of an inch can be estimated so as to be appreciable and measured, but the indistinctness of a portion of the image revealed the fact. The rays of light which fall upon that part of the lens go beyond the focal length, and render the object indistinct, and confuse the image. This portion of the lens has to be "stopped out" when extraordinary accuracy of definition is required; as, for instance, in ob-

serving so fine a point as the third ring of Saturn; and, as the aperture is so large, the absence of this small portion of the rays is not important, the quantity of light being so great. It was at first feared that the attempt to correct this defect might produce the inconvenience of over correcting it, and produce an error on the other side; but Mr. Gravatt has devised a plan by which the lens, which was polished in the first instance by four workmen, may now be repolished, by machinery, upon such accurate mathematical principles as will prevent the possibility of error. The machinery is somewhat similar to that by which the reflector of Lord Rosse's gigantic telescope was polished, with the difference that the reflector being concave and the Craig lenses convex, the machinery will act reversely.

Like Lord Rosse's great reflector, the achromatic telescope on Wandsworth-common can only exert its marvellous powers when the weather is calm as well as clear. During the last three weeks, although a succession of scientific visitors have been watching on the common, only one night proved favourable, and that for merely the space of half an hour. When there is any atmospheric disturbance, arising either from high winds or from a high temperature, during the day, followed by cold at night, the objects in the glass are seen in motion, rising and surging like the waves of the sea. This disturbance which is seen more or less in all large telescopes, is owing to the movement of different strata of air, the more heated portion ascending, and the cold air descending to supply its place.

Thesite upon which the telescope and its tower stands, and which is about a mile and a half from the Clapham station of the South-western Railway, is of the extent of about two acres, and has been liberally granted, free of rent, by Earl Spencer so long as the telescope is maintained there. The ground is at present surrounded by a boarding, the building and its appurtenances being still in the hands of Mr. Gravatt and his workmen. It is intended to erect a small house within the enclosure for the use of the resident observer or astronomer who may be placed in charge of the instrument; but as the arrangements are not yet completed, and the instrument itself not finally adjusted, no provision has been made to enable the public to inspect this last marvel of science, which we have no doubt will soon become one of the lions of the metropolis.

Not the least of the benefits which Mr. Craig has conferred upon astronomical science, is the practical demonstration of the fact, that achromatic telescopes of this vast size and extraordinary range may be constructed at comparatively small cost, thus doing away with the necessity for the more expensive and elaborate arrangements required for the great reflecting telescopes. The simple and effective mechanism devised by Mr. Gravatt is another illustration of the advance we have made in the mechanical arts, and fully justifies the soundness of judgment evinced by Mr. Craig in his selection of an engineer. Whether the reverend gentleman, to whom the public are already so much indebted, will go still further and appoint an astronomer to reside upon Wandsworth-common, or whether the Government will take upon itself to endow the Craig Telescope, and appoint a professor, with a salary, remains to be seen; but we trust, for the credit of the country, the latter will be done, and that out of the abundant means at its disposal, the State will not grudge the small annual stipend which may be necessary for this purpose, and relieve Mr. Craig, who has already expended a considerable sum out of his private means, from any further charge in connection with the efficient maintenance of this wondrous instrument.

PIRSSON'S DOUBLE-VACUUM STEAM CONDENSER.

In pursuance of an order, bearing date on the 12th of May last, issued by Commodore W. B. Shubrick, of the American Navy, in a Commission of Examiners into the admirable arrangement known as Pirsson's Double-Vacuum Steam Condenser, the construction and working of which we have on former occasions described in detail and commended, the following Report has been made to that officer, signed by Charles B. Stuart, Engineer-in-Chief, U. S. N., and W. P. Williamson, Chief Engineer, U. S. N., and W. Sewell, Chief Engineer, U. S. N. From this Report it will be perceived—and we feel pleasure in directing attention to the fact—that the investigations set on foot by the American Government with reference to Mr. Pirsson's invention have resulted in the application of the apparatus to the machinery of the steamship of war *Alleghany*. The Commissioners report as follows:—

"That we were previously well acquainted with the various plans of surface condensers that had been proposed from time to time during the progress of steam engineering. We had already investigated their advantages and disadvantages as a part of our professional studies, and *were not able to extract from the report of the commission any information on this subject additional to what may be found in published records.*

"In order, however, to leave no oppor-

tunity unimproved of obtaining a thorough knowledge of the latest types of the two surface condensers that appeared to be most favourably noticed by the commission (viz., Pirsson's and Miller's), we asked and received instructions from the Bureau of Construction, &c., to repair to Brooklyn and Jersey City, for the purpose of witnessing their practical operation. As we are required to "report summarily and without unnecessary delay," we shall touch generally only the important features of the subject, in at once categorically answering the questions of the resolution.

"*Question* 1st. The advantages and disadvantages of the present system of jet condensation, for marine engines, as compared with the proposed system of surface condensation, and the amount of saving to be effected by the one or the other.

"ANSWER. The advantages of the jet over the surface condenser consist solely in its greater simplicity, less bulk, and less first cost; but in this connection must be stated that both bulk and first cost of either condenser is only a very small fraction of the total bulk or total cost of a marine engine; too small, indeed, for consideration in a general comparison.

"The disadvantages of the jet compared with the surface condenser arise from its supplying marine boilers with sea water instead of distilled water. The evils resulting from the use of sea water are well known to be caused by the salts of lime (principally sulphates) held in solution, and which precipitate at a very low concentration when subjected to the temperatures of marine boilers in ordinary practice. If the concentration exceed twice the natural density of sea water, deposition of limestone, technically termed "*scale*," takes place, the entire heating surface of the boiler becomes covered with a thick envelope, the narrow water spaces between the flues and tubes fill up solid, and the metal of the boiler, no longer protected by the water, is exposed to the action of intense heat; the results are great diminution in the amount of steam generated, and the rapid burning out and destruction of the boiler itself.

"These evils can only be avoided by extracting a portion of the *hot* concentrated water in the boiler, and supplying its place with an equal bulk of sea water of the natural density, and necessarily *lower* temperature, whence results an inevitable loss of heat or fuel.

"This extraction is technically called '*blowing off*.' The loss of fuel varies for different temperatures and densities; but taking the general average of practice in marine boilers, where the concentration is kept at twice the natural density, and at the temperature of 251° Fahr., corresponding to a steam pressure of 15 lbs. per square inch above the atmosphere, it amounts to about 12 per cent. This large per centage of loss of fuel by 'blowing off' *is entirely saved by the use of a surface condenser*.

"Practically, however, it is found impossible with this, or even a much greater amount of 'blowing off' to prevent the deposition of 'scale,' because in all marine boilers, how carefully soever they may be managed, there are frequent times when either the concentration or the temperature of water, or both, will exceed the limit of non-precipitation, and a deposit will take place; thin, indeed for any given time, but amounting in the aggregate, during six or nine months' steaming, to a sufficient thickness of non-conducting matter to cause a serious loss of fuel. This loss, which we estimate, from our observations during an extensive practice, to amount to an average of at least 7 per cent.; for the life of the boiler, would also be entirely saved by the use of a surface condenser.

"The total saving of fuel alone from these causes, by a surface condenser, is therefore not less than 19 per cent. Another and a very considerable gain can be obtained from a surface over a jet condenser with sea water, arising from the greater extent to which the use of expanded steam can be carried.

"Expansion cannot judiciously be carried very far without a high pressure.

"With the *distilled* water furnished by a surface condenser the pressure is limited only by the strength of the boiler. With the sea water, however, furnished by a jet condenser, the pressure is limited comparatively to a *low* point, from the fact that the temperature of the sea water increases with the pressure, while its power to hold the salts of lime in solution decreases rapidly with that increase of temperature; a point is therefore soon reached when the greatest amount practicable of 'blowing off' is insufficient to prevent the large deposition of 'scale.' A further advantage of surface condensation is, the increased durability of the boiler. Judging from the experiments of the past several years, the life of an iron boiler would be extended 60 per cent.; that is, an iron boiler that lasts five years with sea water, will last eight or nine years with distilled water. With regard to copper boilers, experiment is wanting; but it may be estimated that their increased durability, from using distilled water, will be nearly equal to that of iron.

"With surface condensation, however, there would be no necessity of using copper

boilers at all, and their great cost—about three times that of iron boilers—would be avoided.

"As a necessary result from the saving of 19 per cent. of the fuel now used with sea water, would be a saving of 19 per cent. in the size, and, by consequence, in the first cost of boilers.

"This resulting advantage in regard to space is particularly valuable in war steamers, as it allows increased stowage for coal.

"The advantage of surface over jet condensation may, then, be briefly summed up as follows:

"1st. Using steam with the same measure of expansion, there would be a saving of 19 per cent. of the fuel.

"2nd. There could be obtained a greatly increased result from the same fuel, by using higher pressure and a greater degree of expansion than is practicable with sea water.

"3rd. Increasing the duration of boilers about 60 per cent., which would reduce their cost in that proportion for a series of years.

"4th. Effecting a reduction of 19 per cent. in the size, weight, and first cost of boilers, using steam with the same measure of expansion.

"To appreciate the money value of the above advantages to the Navy, it is necessary to know the cost of the boilers and the quantity of coal consumed by the Navy steamers. At a moderate estimate, this will amount during the next fiscal year, for our present number of steamers, allowing them to steam one-third of their time, to 28,500 tons, which, at the average cost of 9 dollars per ton, for home and foreign service, amounts to 256,500 dollars, 19 per cent. of which is 48,735 dollars. The cost of all the present copper boilers in the Navy is 475,000 dollars; of the iron boilers, 80,000 dollars; the increased durability of these boilers, estimated as before, amounts to 27,111 dollars per annum, making 75,846 dollars per annum. If to this be added the saving of 19 per cent. on the first cost of the boilers, divided by the life of the boilers, viz. 7,536 dollars, it will make the total saving of 83,382 dollars per annum, with our present small steam marine. The above estimate is exclusive of the cost of replacing boilers, which will be proportioned to their duration, and also of the loss of the use of the vessels.

"Nor does that estimate include the advantage to be derived from the use of a higher measure of expansion.

"To the advantages already enumerated may be added the following, which cannot be estimated in money, viz., that the time for which a steamer could keep at sea would be increased in the proportion of the additional fuel carried, and of the amount saved.

"*Question* 2nd. If the advantages should be found to be in favour of the surface condenser, is the combination proposed in said report practicable, and in what manner can it be arranged for the purpose intended?"

"*Answer*. The combination proposed by the Commission (Messrs. Cresson and Alexander), is the double vacuum of Pirsson, the single-jointed tube of Miller, the heater of Baldwin, and the evaporator of Lynch; which combination is in our opinion *neither* PRACTICABLE *nor* DESIRABLE, for the following reasons in brief:

"1st. That from the double vacuum of Pirsson is derived *all the advantages* that could be obtained from Miller's system of separating the tubes at their ends without the attending disadvantages of increased bulk, or more inefficient circulation through the tubes, and a more expensive construction.

"2nd. The combination of the heater of Baldwin and the evaporator of Lynch would increase the cost, complication, and liability to derangement; while it would add but little, if any, to the economy, for the reason that when the steam is relieved from pressure, as when leaving the cylinder of a steam engine, its temperature is lowered almost instantaneously to that of the condenser; consequently this cooled steam would not be hot enough to materially heat or evaporate water.

"*Question* 3rd. What is the best surface condenser known, considering the proposed combination, if practicable and economical, as one among the instruments to be examined in this comparison?"

"*Answer. We consider Pirsson's to be the best surface condenser known*, for the following reasons:

"No surface condenser can be safely or judiciously used except it contain a provision, or is so arranged, that it can instantaneously and at will be converted into a common jet condenser, in the event of fracture or other derangement of the pipes, parts, &c. A surface condenser must possess, therefore, important property; if this be absent, other merits may deserve admiration, but cannot recommend it as practical; and here we fully agree with the Commission in h e following opinion, viz., 'that we would not be willing to trust a vessel of our own property without a full provision for a resort to an ordinary injection condenser, and which we cannot but consider as the *first* and *most essential* point in any device of the kind.' This important requisite, the Commission truly states, belongs to Pirsson's condenser, and they also attribute it to Symington's. *Pirsson's*, however, *is the only condenser presenting the* NEW *and important features of the* DOUBLE VACUUM, by which the condensing surfaces are relieved from the atmospheric pressure, and consequently strain

and leakage; causes *alone* of the failure of all other plans of surface condensation. This is not the case with Symington's condenser mentioned by the Commission in connection with Pirsson's as effecting the same objects. Symington's has a *single* vacuum, and if used as a surface condenser has all the disadvantages of the atmospheric pressure on the pipes, similar to Hall's, Miller's, and others.

"*Question* 4. Is it advisable to make this application of the most approved condenser to all steamers of the Navy?

"*Answer*. We are of opinion that, for the reasons hereinbefore stated, *it is advisable to apply, as soon as practicable*, THE CONDENSER OF PIRSSON, as now being fitted to the United States steam-ship *Allegheny*, TO ALL STEAMERS *of the Navy, plying in salt water*.

"This condenser has already been applied to eight merchant steam-ships; it has been in use in some of them for several years, and the practical results fully bear out our estimate and opinions. There are also two large steam-ships now being fitted with it at New York.

"The Report of the Commission, and papers submitted, are herewith returned."

PATENT LAW AMENDMENT ACT, OCTOBER, 1852.

Second Set of Rules and Regulations.

The second set of Rules and regulations under the Patent Law Amendment Act, 1852, having just been issued, we give them below, and the first set also, dated 1st October, as some amendments have been introduced into them.

First Set of Rules and Regulations under the Act 15 & 16 Vict. c. 83, for the passing of Letters Patent for Inventions.

By the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain, the Right Honourable Sir John Romilly Master of the Rolls, Sir Frederic Thesiger Her Majesty's Attorney-General, and Sir Fitzroy Kelly Her Majesty's Solicitor-General, being four of the Commissioners of Patents for Inventions under the said Act.

Whereas a commodious office is forthwith intended to be provided by the Crown as the Great Seal Patent-office; and the Commissioners of Her Majesty's Treasury have, under the powers of the said Act, appointed such office as the office also for the purposes of the said Act.

All petitions for the grant of Letters Patent, and all declarations and provisional specifications, shall be left at the said Commissioners' office, and shall be respectively written upon sheets of paper of twelve inches in length by eight inches and a half in breadth, leaving a margin of one inch and a half on each side of each page, in order that they may be bound in the books to be kept in the said office.

Every provisional protection of an invention allowed by the Law-officer shall be forthwith advertised in the *London Gazette*, and the advertisement shall set forth the name and address of the Petitioner, the title of his invention, and the date of the application.

Every invention protected by reason of the deposit of a complete specification shall be forthwith advertised in the *London Gazette*, and the advertisement shall set forth the name and address of the Petitioner, the title of the invention, the date of the application, and that a complete specification has been deposited.

Where a Petitioner applying for Letters Patent after provisional protection, or after deposit of a complete specification, shall give notice in writing at the office of the Commissioners of his intention to proceed with his application for Letters Patent, the same shall forthwith be advertised in the *London Gazette*, and the advertisement shall set forth the name and address of the Petitioner and the title of his invention; and that any persons having an interest in opposing such application are to be at liberty to leave particulars in writing of their objections to the said application at the office of the Commissioners within twenty-one days after the date of the *Gazette* in which such notice is issued.

The Lord Chancellor having appointed the Great Seal Patent-office to be the office of the Court of Chancery, for the filing of specifications, the said Great Seal Patent-office and the office of the Commissioners shall be combined; and the Clerk of the Patents for the time being shall be the Clerk of the Commissioners for the purposes of the Act.

The office shall be open to the public every day (Christmas Day and Good Friday excepted), from ten to four o'clock.

The charge for office or other copies of documents in the office of the Commissioners shall be at the rate of twopence for every ninety words.

Signed) ST. LEONARDS, C.
JOHN ROMILLY, M.R.
FRED. THESIGER, A.G.
FITZROY KELLY, S.G.

Dated the 1st Oct., 1852.

PATENT LAW AMENDMENT ACT, 1852, 15 & 16 VICT. c. 83.

By the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain, and the Right Honourable Sir John Romilly Master of the Rolls.

Ordered, that there shall be paid to the Law-officers and to their clerks the following fees:—

By the Person opposing a Grant of Letters Patent.

	£	s.	d.
To the Law-officer	2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the Petitioner on the Hearing of the Case of Opposition.

	£	s.	d.
To the Law-officer	2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the Petitioner for the Hearing, previous to the Fiat of the Law-officer allowing a Disclaimer or Memorandum of Alteration in Letters Patent and Specification.

	£	s.	d.
To the Law-officer	2	12	6
To his clerk	0	12	6

By the Person opposing the Allowance of such Disclaimer or Memorandum of Alteration, on the Hearing of the Case of Opposition.

	£	s.	d.
To the Law-officer	2	12	6
To his clerk	0	12	6

By the Petitioner for the Fiat of the Law-officer allowing a Disclaimer or Memorandum of Alteration in Letters Patent and Specification.

	£	s.	d.
To the Law-officer	3	3	0
To his clerk	0	12	0

(Signed) ST. LEONARDS, C.
JOHN ROMILLY, M.R.

Dated the 1st Oct., 1852.

PATENT LAW AMENDMENT ACT, 1852. 15 & 16 VICT. c. 83.

Ordered by the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain.

All specifications in pursuance of the conditions of Letters Patent, and all complete specifications accompanying petitions and declarations before grant of Letters Patent, shall be filed in the Great Seal Patent-office.

All such specifications shall be respectively written upon both sides of a sheet or sheets of parchment, each page being of the size of eighteen inches in length by twelve inches in breadth, leaving a margin of one inch and a half on each side of each page, in order that they may be bound in the books to be kept in the said office; but the drawings accompanying such specifications, if any, may be made upon larger sheets of parchment than of the size of eighteen inches by twelve inches, leaving a margin of one and a half inches, as aforesaid.

The charge for office or other copies of documents in the Great Seal Patent-office shall be at the rate of twopence for every ninety words.

(Signed) ST. LEONARDS, C.

Dated the 1st Oct., 1852.

Second Set of Rules and Regulations under the Act 15 & 16 Vict. c. 83, for the passing of Letters Patent for Inventions.

By the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain, the Right Honourable Sir John Romilly Master of the Rolls, Sir Frederic Thesiger Her Majesty's Attorney-General, and Sir Fitzroy Kelly Her Majesty's Solicitor-General, being four of the Commissioners of Patents for Inventions under the said Act.

The office of the Director of Chancery in Scotland, being the office appointed by the Act for the recording of Transcripts of Letters Patent, shall be the office of the Commissioners in Edinburgh for the filing of copies of specifications, disclaimers, memoranda of alterations, provisional specifications, and certified duplicates of the register of proprietors.

All such transcripts, copies, and certified duplicates shall be bound in books, and properly indexed; and shall be open to the inspection of the public at the said office, every day from ten to three o'clock.

The charge for office copies of such transcripts, copies, and certified duplicates, recorded and filed in the said office, shall be at the rate of twopence for every ninety words.

The Enrolment-office of the Court of Chancery in Dublin, being the office appointed by the Act for the enrolment of transcripts of Letters Patent, shall be the office of the Commissioners in Dublin for the filing of copies of specifications, disclaimers, memoranda of alterations, provisional specifications, and certified duplicates of the register of proprietors.

All such transcripts, copies, and certified duplicates shall be bound in books, and properly indexed, and shall be open to the inspection of the public at the said Enrolment-office every day (Christmas Day and Good Friday excepted), from ten to three o'clock.

The charge for office copies of such transcripts, copies, and certified duplicates, en-

rolled and filed as aforesaid, shall be at the rate of twopence for every ninety words.

No Warrant is to be granted for the sealing of any Letters Patent which contains two or more distinct substantive inventions.

A provision is to be inserted in all Letters Patent in respect whereof a provisional and not a complete specification shall be left on the application for the same, requiring the specification to be filed within six months from the date of the application.

No amendment or alteration, at the instance of the Applicant, will be allowed in a Provisional Specification after the same has recorded, except for the correction of clerical errors or of omissions made *per incuriam.*

The Provisional Specification must state distinctly and intelligibly the whole nature of the invention, so that the Law-officer may be apprized of the improvement, and of the means by which it is to be carried into effect.

The fee to be paid for every duplicate of such Letters Patent as may have been destroyed or lost shall be One Pound.

Where the Applicant desires his Letters Patent to extend to any of the Colonies, he must specify in his Petition for the same the particular Colony or Colonies to which he desires it to extend; and when the Applicant shall give notice of his intention to proceed with his Application for Letters Patent, the Law-officer to whom such application is referred shall hear him or his agent upon such extension; and the said Law-officer shall make his report to the Lord Chancellor thereon. And no Warrant for Letters Patent containing such extension shall be made unless the Lord Chancellor shall allow the same.

(Signed) ST. LEONARDS, C.
JOHN ROMILLY, M.R.
FRED. THESIGER, A.G.
FITZROY KELLY, S.G.

Dated the 15th Oct., 1852.

Ordered by the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain.

Every application to the Lord Chancellor against or in relation to the sealing of Letters Patent shall be by notice, and such notice shall be left at the Commissioners' Office, and shall contain particulars in writing of the objections to the sealing of such Letters Patent.

(Signed) ST LEONARDS, C.

Dated the 15th of Oct., 1852.

[By an order dated Oct. 15, the Rules and Instructions issued by the Law-officers (*ante* p. 235) have been re-called and annulled.]

DRAY AND CO.'S RIGHT AND LEFT-HAND HILL-SIDE PLOUGH.

(Registered under the Designs' Act.)

This is an implement of great ingenuity and simplicity, by means of which two important objects in plough husbandry are satisfactorily attained. The one is to throw the furrow constantly in the same direction, without reference to the direction of the course of the plough; and the second is to adapt the wheels to the required depth of the furrow. It will be seen from the accompanying description and representation of this plough, that both have been accomplished with considerable facility as regards working, and with the prospect of considerable advantage. The whole invention is exhibited in the figures.

Fig. 1 is a side-elevation of the plough in its complete state. Fig. 2 is an elevation of a part of the same, in which the substantial part of one of the improvements occurs; and fig. 3 is a plan of fig. 2.

The middle piece B is securely bolted to the beam AA. Upon the sides of the middle piece B, two "slades" CC slide up and down by means of bars which fit into them, and which traverse in the slots *aa*, *a'a'*, cut through the middle pin B. The slades are raised or depressed by their levers DD', according as either is to be in or out of gear. EE (figs. 1 and 3) are right and left-hand breasts attached at one end to the slades C, while their other ends can be thrust out from, or drawn in towards, the middle line of the plough, by means of the expanding irons F F. G G are the plough-shares.

The action of the plough is as follows: —In fig. 1, the left-hand slade and share are shown out of gear, while the right-hand slade and share are in the position for working the plough, proceeding in the direction indicated by the arrow. When the plough has reached the end of the furrow, and has been turned round in order to travel in the reversed direction, the left-hand slade and share are brought into work by raising the lever D', and the right-hand slade and share are lifted out of work by depressing the lever D. By this arrangement the furrow is always thrown one way, in whichever direction the plough is being drawn. The use of the expanding irons, F and F, is to ad-

just the plough to throw furrows of any required width.

For the second part of the improvements embraced by this design, the mechanism is even more simple. It is shown in fig. 1. HH, the two wheels, have their axles centred in the lower extremities of the two toothed racks I I,

Fig. 1.

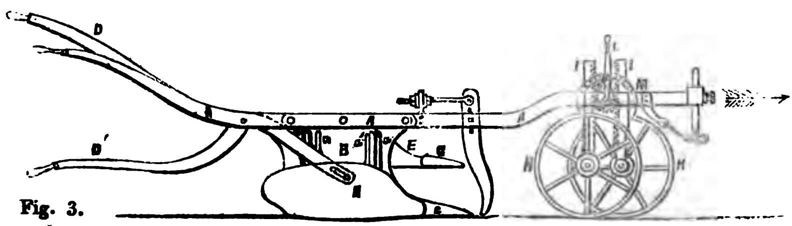


Fig. 3.

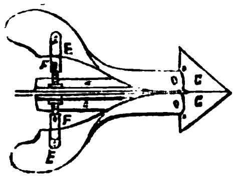
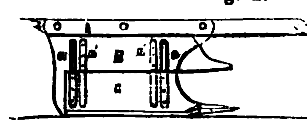


Fig. 2.



into each of which the pinion K gears. By turning this pinion, it is evident that one rack will be raised and the other lowered; to which there is no objection, as each wheel has its axle independent of the other. L is a lever or handle fitted to the end of the spindle of the pinion K, by which it is easily turned in either direction. The advantage of this arrangement is that the wheels HH may be adjusted to the required depth of the furrow; one of them running in the furrow itself, while the other runs upon the surface of the land. The lever is readily retained in any assigned position by means of the pin *e*, which passes through a hole formed in it, and aslo through one of several holes in the circular segment *m*, attached to the beam transversely.

This is another improvement in the practice of husbandry, for which the agricultural community are indebted to Messrs. Dray and Co, and which also promises to be of considerable benefit wherever it is adopted.

M. DE PORQUET'S "UTILITARIAN."

The machine sold by Mary Wedlake and Co., of 118, Fenchurch-street, under the title of the "Utilitarian," and of which an engraving will be found in the advertisement, is an extremely simple and inexpensive contrivance, by means of which several important advantages are introduced into certain manual operations connected with the management of the stable. This important invention was registered in the month of April last, and by its excellent working has gained the approbation of agriculturists, and of others to whom the economy which results from it is a matter of moment. With the help of the "Utilitarian," the cutting of straw or chaff, and the bruising of oats, can be carried on either simultaneously or separately, according as it may be desired. It is, in fact, a chaff-cutter and an oat-bruiser united in one machine, both functions being capable of being carried on at one time through its instrumentality, or separately should it be preferable.

The convenience of such a method, and the economy of time, labour, and money that must result from it, it is needless to point out. It has been ascertained that by working the machine at the usual speed of such machines, the chaff-machine will do from ten to fifteen bushels per hour, and the oat-

bruiser from two to three bushels per hour. With these recommendations for the "Utilitarian," it must come into very general use; and wherever employed, it will never be found to disappoint the expectations which will naturally be founded upon its name.

RAILWAY BRIDGE OVER THE NIAGARA RIVER.

We extract from the last Number of the *Canadian Journal* the following account of a bridge to be constructed across the Niagara river, by which the railway system of Canada and of the States of the Union will be connected:

"The bridge will form a single span of 800 feet in length. It is to serve as a connecting link between the railroads of Canada and the State of New York, and to accommodate the common travel of the two countries. It is established by ample experience, that good iron wire, if properly united into cables or ropes, is the best material for the support of loads and concussions, in virtue of its great absolute cohesion, which amounts to from 90,000 to 130,000 lbs. per square inch, according to quality. The bridge will form a straight hollow beam of 20 feet wide and 18 feet deep, composed of top, bottom, and sides. The upper floor, which supports the railroad, is 24 feet wide between the railings, and suspended to two wire cables assisted by stays. The lower floor is 19 feet wide and 15 feet high in the clear, connected with the upper one by vertical trusses forming its sides, and suspended on two other cables, which have 10 feet more deflection than the upper ones. The anchorage will be formed by sinking eight shafts into the rock, 25 feet deep. The bottom of each shaft will be enlarged for the reception of cast-iron anchor plates of 6 feet square. These chambers will have a prismatical section, which, when filled with solid masonry, cannot be drawn up without lifting the whole rock to a considerable extent. Saddles of cast iron will support the cables on the top of the towers. They will consist of two parts—the lower one stationary, and the upper one moveable, resting upon wrought-iron rollers. The saddles will have to support a pressure of 600 tons whenever the bridge is loaded with a train of maximum weight. The towers are to be 60 feet high, 15 feet square at the base, and 8 feet at the top. The compact, hard limestone, used in the masonry of the towers, will bear a pressure of 500 tons upon every foot square:

"*Weight of Bridge.*

	lbs.
Weight of timber	910,130
Wrought iron and suspenders ..	113,120
Castings	44,332
Rails	66,740
Cables between towers	534,400
	1,678,722

"*Weight of Railroad Trains.*

	tons.
One locomotive	25
Twenty-seven double freight cars, each 25 feet long, and of 15 tons gross weight	405
Making a total gross weight of 430 tons which fall upon the cables when the whole bridge is covered by a train of cars from end to end; and to this 15 per cent. weight of pressure as the result of a speed of 5 miles per hour, which is a very large allowance	61
Add weight of superstructure ..	782
Total aggregate maximum weight ..	1,273

"The tension of cables, which result from a weight of 1,373 tons, and an average deflection of 59 feet, is 2,340 tons. Since the assumed maximum tension can but rarely occur, it is considered ample to allow four times the strength to meet this tension—that is 8,960 tons. But assuming 2,000 tons as a tension to which the cables may be subjected, five times the strength to meet it is allowed, and an ultimate strength of 10,000 tons provided for. For this purpose, 15,000 wires of No. 10 will be required. At each end of the upper floor the upper cables will be assisted by eighteen wire rope stays, and their strength will be equivalent to 1,440 wires; these deducted leave the number of wires in the four superior cables 13,560, the number of wires in one cable 3,390, diameter of cable 9½ inches. The railroad bridge will be elevated 18 feet on the Canadian, and 28 feet on the American side, above the present surface of the bank, and above the present structure. It will be the longest railroad bridge, between the points of supports, in the world."

THE "DUKE OF WELLINGTON" WAR STEAMER.

It appears from a private letter from Greenock, dated the 22nd inst., that the *Cyclops*, commanded *pro tem.* by Lieutenant Secombe, of the *Horatio*, arrived at that port on the 12th inst., having towed the *Blazer* from Gravesend in six days. The whole of the boilers (four in number) in-

tended for the *Duke of Wellington* are not made, nor the engines for that ship ready, and it will be the end of the present month ere any portion of the machinery will be embarked in the *Blazer*. This vessel at one time can only stow one boiler and a part of the machinery; hence she will have to make four trips from Greenock to Portsmouth. Under the most favourable conditions of wind and weather, it is calculated the *Cyclops* will occupy ten days in towing the *Blazer* the distance between these ports. The end of the present year will consequently have nearly arrived before the whole of the machinery for the "great Duke" has reached its destination.

THE IRON TRADE.

Iron has risen at least a third of late, and is still "looking up." It is alleged that the Messrs. Baird, of Gartsherrie, were purchasers before the rise, and have cleared in six weeks 400,000*l*.—*Falkirk Herald*.

There has been a rise of wages to the people in the iron trade at Dunfermline. The people of the Oakley Iron-works have received a second rise of wages, with the promise in a short time of a third. The damask-weavers of Dunfermline and its suburbs are also to receive an allowance of one penny per spindle.

By the advices from New York to the 16th instant, brought to Liverpool on Wednesday, by the United States steamer *Atlantic*, it appears that Scotch pig-iron had further advanced; it was quoted at 26 dls. to 27 dls. for cash; 27½ dls. to 28 dls. at six months; and at 29 dls. from the store. Several hundred tons bar-iron sold at 47 dls. to 50 dls. Freights to London unaltered.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING OCTOBER 26, 1852.

JOHN KNOWLES, of Little Bolton, Lancaster, cotton spinner. *For improvements in certain machinery for preparing cotton and other fibrous substances, for reversing the direction of motion in, and for regulating the speed of machines.* Patent dated April 17, 1852.

This patent comprehends,

1. An arrangement for stopping the motion of drawing frames and similar apparatus, when a roving breaks or fails to be supplied.

2. An arrangement for reversing the motion of warping mills and other machines, where an alternating motion in opposite directions is required.

3. An arrangement of parts to be combined with the ordinary ball governor of steam engines, for operating the expansion valves or throttle valve, and thereby regulating the speed of the engine.

WILLIAM HYATT, of Old-street-road, engineer. *For improvements in obtaining and applying motive power.* Patent dated April 17, 1852.

The *first* branch of this invention comprises a new form of rotary engine. The cylinder is slightly excentric interiorly, and the main shaft passes excentrically through it. The piston is free to slide on the shaft, whilst causing it to revolve, so as to adjust itself to the varying diameter of the cylinder, and is packed at the end, so as to preserve steam-tight contact in every position it may assume.

The *second* branch consists of a mode of applying internal steam chambers in steam boilers, so as to displace the principal portion of the mass of water therein, and expose an increased evaporating surface. The internal chamber receives its supply of steam from the water in the boiler; and may be made to act beneficially in heating the feed water, by conveying the feed pipe through it to the centre, and hottest part of the boiler, so that the feed water will receive a considerable accession of heat during its introduction.

The *third* branch includes some improvements in the construction of reciprocating engines, where four or more pistons, acting in pairs, are employed to a single cylinders The motion of the pair of pistons will be given off in opposite directions, and applied to the crank shaft through suitable connecting rods.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in the the method of, and apparatus for, indicating and regulating the heat and height and supply in water to steam boilers, which said improvements are applicable to other purposes, such as indicating and regulating the heat of buildings, furnaces, stoves, fireplaces, kilns, and ovens, and indicating the height and regulating the supply of water in other boilers and vessels.* (A communication.) Patent dated April 17, 1852.

The patentee describes and claims,

1. A mode of applying the principle of the expansion and contraction of metals under changes of temperature, to act as a regulator to a valve or other apparatus set in motion by independent mechanism, for the admission of air into buildings and apartments, for purposes of ventilation.

2. A mode of employing a float in a steam or other boiler, to act as a check or stop to apparatus actuated by independent

means, for regulating the heat, and height, and supply of water to steam and other boilers.

ROBERT GRIFFITHS, of Clifton, engineer. *For apparatus for improving and restoring human hair.* Patent dated April 20, 1852.

The patentee proposes, in order to improve and restore the hair, the employment of combs and brushes so constructed as to produce a galvanic current, or combined with batteries for that purpose. The teeth of combs are made of copper and zinc alternately, continued back to a chamber in the hinder part of the comb, where is placed a roll of flannel saturated with a weak exciting solution, such as salt and water or very dilute acid. The brushes are made with bristles of fine wire of zinc and copper, in connection with a battery, suitably excited, at the back of the brush; or they may have a portion of the bristles only of wire, in connection with the battery, and the remainder of hair.

Claim.—The combining and arranging parts into combs and brushes, or such like instruments, suitable for passing through the hair or against the skin, so that electric currents may be obtained when in use.

ROBERT REYBURN, of Greenock, chemist. *For improvements in printing on silk and other fabrics, and yarns.* Patent dated April 20, 1852.

The patentee makes printing blocks or rollers by thickening colour with gum, spreading it into sheets and cutting out the pattern, and inlaying it in its various colours, after the fashion of mosaic work, the sheet in which the pattern is inlaid being selected of the ground or predominant tint. Blocks thus formed may be used as such and moistened by steam when applied to the fabric, on which they will leave at one impression a perfect pattern, or they may be cut into thin sheets and lapped round rollers, which may be used as in cylinder printing.

Claim.—The making of printing blocks from colour thickened with gum or other substance, and the printing of silk and other fabrics, and yarns, with the said blocks.

JOHN TROTMAN, of Dursley, Gloucestershire. *For improvements in anchors.* Patent dated April 20, 1852.

Mr. Trotman's improvements have relation principally to the class of anchors known as "Porter's Patent," and consist,

1. In forming or affixing the palm intermediately of the breadth of the arm, instead of in front of the arm, as in Porter's original patent.

2. In making the horn of greater width than the arm. This improvement is applicable to anchors generally.

3. In forming the palm of Porter's anchors at the back of the arm.—No claims.

JAMES STEVENS, of Birmingham, glass manufacturer. *For certain improvements in lamp glasses.* Patent dated April 22, 1852.

These improvements consist in forming lamp glass with a series or row of convex lenses attached round the same, for the purpose of increasing the brilliancy of the light. The lenses are formed in the same piece with the glasses, by using moulds of suitable shape in the process of manufacture.

Claim.—The application of convex lenses to lamp glasses.

EDWARD HAMMOND BENTALL, of Heybridge, ironfounder, and JAMES HOWARD, of Bedford, ironfounder. *For improvements in the mode of chilling cast iron.* Patent dated April 2, 1852.

The mode adopted by the patentees consists in forming the chills or moulds, in which the castings are made, hollow, and in connecting with them suitable exhausting or forcing apparatus, for causing a current of air to circulate through the same, so as to prevent overheating of the mould and keep it at a working temperature for as long a period as may be. A stream of water may also be caused to circulate through the hollow of the mould, for the same purpose, and when water is thus employed it should have a rapid motion, in order to prevent, as much as possible, the formation of steam.

Claim.—The mode of chilling cast iron described in any and all of its modifications.

Specification Due but not Enrolled.

WILLIAM MADDICK, of Manchester, manufacturing chemist. *For the production of a liquid extract from madder, and its preparations, suitable for the purposes of dyeing or printing, and a new treatment of spent madder, garancine or garanceaux, or other preparations of madder, to render them available for the like purposes.* Patent dated April 20, 1852.

Quartz Mining in America.—It appears by the American news brought by the Mail of Wednesday, that quartz mining in that country is about to be carried on with great vigour. It is expected that some millions of dollars will be invested this season in developing and working the veins.

Launch of the "Bengal."—This leviathan iron steamship—the largest ever built at Glasgow—will be lauched from the building-yard of Messrs. Tod and M'Gregor, at the confluence of the Kelvin with the Clyde, on the 28th inst., at about two o'clock. The *Bengal* belongs to the Peninsular and Oriental Company, and from her enormous dimensions, (being, we believe, longer than the *Great Britain*), the launch will, no doubt, be a grand sight.—*North British Daily Mail.*

National Defence.—We understand that ten line-of-battle ships being built, or ordered to be built, in the Royal Dockyards, are ordered to be fitted with screw machinery.—*Herald* (Ministerial paper).

Danish Railways. — "Sir Charles Fox, of the enterprising firm of Fox and Henderson, of Birmingham, arrived at Copenhagen, on the 21st inst., to make a contract for the construction of the railway from Rothschild to Korsoer."

NOTICES TO CORRESPONDENTS.

J. H.—The British Classes Nos. 5 and 6 have been searched for the Watch-guard Knitting Machine of which you speak. A hair-working machine, exhibited by Mr. W. Thompson, of King's College, is entered Class 6, No. 503. Most probably this is the machine you refer to. If not, you must state whether the machine is of foreign manufacture.

Mills' Patent Boiler.—We have received a letter signed "Joseph Hodgkinson," claiming to be the inventor of the boiler patented by Mr. Mills. This appears one of those numerous cases in which, as soon as a practical and valuable invention is produced, parties who have no right to the discovery start up and claim it.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 1, 1852.

8. Richard Wright. Improvements in constructing vessels.

58. William Willcocks Sleigh. An invention for producing motive power, which he entitles "The Counteracting Reaction Motive Power Engine."

Dated October 2, 1852.

148. Edward William Kemble Turner. Certain improvements in machinery for sweeping or cleaning chimneys; also for more effectually extinguishing them when on fire.

149. Edwin Whele. An improved rotary engine, to be worked by steam, air, or gases.

150. Thomas Boyd. Improvements in the treatment or finishing of woven fabrics.

151. David Wilkinson Sharp. Improvements in machinery for combing and drawing a sliver of wool, flax, silk-waste, and other fibrous substances, and in apparatus for constructing screws to be used in a part or parts of such machinery.

152. Eugene De Varroc. Improvements in rendering glass reflective.

153. David Stephens Brown. An Agricultural implement for tilling the soil

154. David Stephens Brown. Obtaining useful products from sewers.

155. David Stephens Brown. An improved means of navigating the water by ships.

156. Joseph Brown. Improvements in beds, sofas, chairs, and other articles of furniture, to render them more suitable for travelling and other purposes.

157. James Mayelston. Improvements in the method of applying heat to the heating of water for feeding or supplying the boiler or boilers of steam engines, or for other purposes.

158. Francis Prime Walker. Improvements in machinery for communicating signals to the drivers of railway engines.

159. Benjamin Fothergill. Improvements in certain machinery for preparing to be spun, cotton, wool, flax, silk, and other fibrous substances.

160. Joseph Burch. Certain improvements in building and propelling ships and vessels.

161. Richard Archibald Brooman. Improvements in purifying and disinfecting fats and fatty bodies, and in separating oleine from stearine.

162. John Ignatius Fuchs. An electro-magnetic apparatus.

163. Moses Poole. Improvements in the manufacture of tables, sofas, bedsteads, stands, chairs, and other articles of furniture, and the frames and bodies of musical instruments.

164. John Robert Johnson. Improvements in fixing colouring matter of madder in printing and dyeing.

165. Moses Poole. Improvements in constructing bridges, viaducts, and such like structures.

166. Samuel Powell. Improvements in the manufacture of certain articles of wearing-apparel.

167. Joseph Faulding. Improvements in machinery for sawing and cutting wood and other substances.

168. John Macintosh. Improvements in compositions to be used as paints.

169. Moses Poole. Improvements in machinery for mowing and reaping.

170. Edward Allport. An improvement in the manufacture of buttons, by making them with elastic shanks.

171. William James Lewis. A slideless stadia sight, applicable to rifles and other firearms.

172. John Jobson. Improvements in manufacturing moulds for casting metal.

173. Theophilus Redwood. Improvements in the manufacture of gelatine.

175. Michael Cavanagh. Certain improvements in mortice-lock spindles.

176. Peter Hyde Astley, and John Figgins Stephens. An improved construction for floating vessels, having for its object the rendering them safe means of transit.

177. William Simpson, and John Shelton Isaac. An improved composition, to be used principally as a substitute for wood or other materials, where strength and lightness are required in the manufacture of various articles.

178. William Edward Newton. Improvements in stoppers for bottles and other similar vessels.

179. Frederic Newton. Improvements in the apparatus to be employed for producing photographic pictures.

180. John Slack. Improvements in the manufacture of textile fabrics.

181. William Edward Newton. Improvements in governors or regulators for regulating the pressure of gas as it passes from the main or other pipes to the burners.

182. Samuel George Archibald. An improved mode of extracting or rendering animal fats and oils.

183. Thomas Green. Improvements in the construction of omnibuses.

184. Joseph Needham. Improvements in breech-loading fire-arms, and in apparatus connected therewith.

185. James Edward MacConnell. Improvements in sheathing iron vessels, and in covering, lining, or coating sheets or other manufactured articles of iron or steel.

186. John Burnie. Improvements in cutting or reducing vegetable substances.

187. Alexander Miller. Improvements in the treatment or finish of textile fabrics and materials.

188. John Weems. Improvements in obtaining and applying motive power.

189. Alexander Willison. Improvements in thrashing machinery.

190. James Anderson Young. Certain improvements in dental operations, and in apparatus or instruments to be used therein.

191. John Stringfellow. Improvements in galvanic batteries, for medical and other purposes.

192. George John Philps. Improvements in hats and other like coverings for the head.

193. Ralph Errington Ridley. Improvements in cutting and reaping-machines.

194. Thomas Lawrie. Improvements in forming and protecting inscriptions and devices in exposed situations.

195. George Stuart. Improvements in heating the fleeces of natural coverings of sheep and other animals when on the animals.

Dated October 4, 1852.

197. John Gooch Marshall. Improvements in rendering weather-tight doors, casements, and other similar openings.

200. Edward Welch. Improvements in fire-places and flues, and in apparatus connected therewith.

201. Martin Watts. Certain improvements in machinery or apparatus for roving or preparing cotton and other fibrous substances for spinning.

202. William Hayward West. Improvements in wind guards and chimney-tops.

203. Robert Hazard. A calorific bath.

204. Bendix Ising Jacoby. Improvements in the means of fixing artificial teeth.

205. Martin Billing. Certain improvements in the combination of metals, having different capacities of vibration, to be used in the construction of certain useful articles.

206. John Moseley. Certain improvements in machinery for cleansing linen and other fibrous materials.

207. William Donald Napier, and William Lund. Improvements in apparatus for steering vessels.

208. Richard Manwaring, and Thomas Hamblin. Improvements in ploughs.

209. James Barrow Storey. Improvements in mouth-pieces for pipes and cigars.

210. Henry Webb, and Joseph Froysell. Improvements in fastening knobs to door and other locks.

211. Thomas Scott. Improvements in applying and transmitting motive power, and in accelerating the progress of bodies in motion.

212. Thomas Slater, and Joseph John William Watson. Improvements in the application of electricity to illuminating purposes.

213. Antoine François D'Henin. Improvements in the treatment and manufacture of tobacco.

214. Thomas Kennedy. Improvements in obtaining and applying motive power, which improvements, or parts thereof, are applicable to time-keepers and clock-work, and for measuring and registering the flow of water and other fluids, and aeriform bodies.

215. John Erskine. Improvements in the manufacture of felted and cemented fabrics.

216. Archibald Brown. Improvements in the construction of sheaves for blocks.

Dated October 5, 1852.

217. Michael Angelo Garvey. An invention for more effectually dissipating the shock of collision in railway trains, reducing the surfaces exposed to atmospheric resistance, and diminishing oscillation by making portions of the whole of each carriage elastic in every direction, and increasing the power of the carriage to resist severe pressure by means of metallic tubes in its longitudinal angles.

218. William Clark. Improvements in the construction of screw propellers for propelling vessels.

220. David Stephens Brown. An improved apparatus or instrument for evaporating or distilling liquids.

221. William Croskill. Improvements in machines for cutting or reaping growing corn, clover, and grass.

222. Aristide Balthazard Berard. Improvements in the construction of jetties, breakwaters, and docks, and other hydraulic constructions.

223. John Houston. Improvements in obtaining motive power when air and steam are used conjointly.

224. John Houston. Improvements in metallic spring packings for pistons.

225. Joseph Apsey. Improvements in shipbuilding and in machinery for propelling.

226. Diego Jimenez. Improvements in the manufacture of soap.

227. Benjamin Mitchell. Improvements in the construction of artificial legs.

228. William Edward Newton. Improvements in machinery for boring or cutting rocks or other hard substances, for the purpose of tunnelling through mountains, or making other excavations.

229. William Edward Newton. Improvements in the means of producing a vacuum for various purposes, such as condensing steam, pumping water, exhausting air, or other purposes where a vacuum is required.

230. James Bullough, David Whittaker, and John Walmesley. Improvements in sizing machines.

231. George Walker Nicholson. Improvements in screw-bolts, nuts, and washers, and in the machinery or apparatus for making the same.

232. John Prestwich the elder, Samuel Prestwich, and John Prestwich the younger. Improvements in machinery or apparatus for cleaning and finishing woven fabrics.

233. William Crook. Improvements in looms.

234. John Balmforth, William Balmforth, and Thomas Balmforth. Improvements in steam boilers, and in fixing the same.

235. Adam and John Booth. Improvements in platting or braiding-machines, which machines are applicable to manufacturing webs for making door and other mats.

236. Robert Brown. An improved taking-up motion, applicable to looms, and other similar purposes.

237. Herm Jäger. Improvements in the treatment of cotton and other similar fabrics, by the introduction of chemical agents to supersede the use of dung in the dunging process.

238. William Gilbert Elliott. Improvements in the manufacture of bricks, pipes, tiles, and other articles capable of being moulded.

239. Pierre Frederic Gougy. Improvements in paving streets, roads, and ways.

240. Thomas Turnbull. Improvements in the preparation and treatment of flax, hemp, and other similar vegetable fibres.

241. Jesse Ross. Certain improvements in machinery or apparatus for combing wool, cotton, silk, flax, and other suitable fibrous materials.

242. William Mackenzie. Improvements in the arrangement and construction of graduated scales for measuring instruments.

243. Samuel Getley. Improvements in water-closets.

244. Joseph Westby. Improvements in machinery applicable to the manufacture of lace and other weavings.

245. William Dray. Improvements in machinery for reaping and mowing.

246. George Hallen Cottam. Improvements in chairs, sofas, and bedsteads.

247. Christopher Nickels, and Frederick Thornton. Improvements in weaving.

Dated October 6, 1852.

249. John Hughes. An improved method of constructing roofs and sides of houses, buildings, and other structures.

250. William Armand Gilbee. An improved mode of disinfecting putrified and fecal matters, and converting fecal matters into manure, also applicable to the disinfection of cesspools, drains, sewers, and other similar receptacles.

251. Auguste Edouard Loradoux Bellford. Improvements in sewing-machines.

252. Jacob Tilton Slade. An improved mode of driving certain machines, and an improved driving band or chain to be used therewith.

253. Charles de Bergue. Certain improvements in machinery for punching metals, and for riveting together metallic plates or bars.

254. Robert Shaw. Pre-arranging, ascertaining, and registering the rate of travelling of locomotive engines, and of railway or other carriages.

255. John Crook, and John Wilkinson Wood. Certain improvements in the method of preserving iron from oxydation or decay.

257. Alexis Delemer. Improvements in machinery or apparatus for manufacturing piled fabrics.
258. David Chalmers. Improvements in looms for weaving wire web or cloth by power.
259. George Walker Nicholson. Improvements in vices, and in the means or method used for fixing the same.
260. William Coles Fuller, and George Morris Knevitt. Certain improvements in applying India-rubber or other similarly elastic substance as springs for carriages.
261. William Abbott. An improved plough.
262. Robert Mortimer Glover, and John Cail. Improvements in miners' or safety lamps.
263. John Gaylord Wells. An improved construction of self-inking stamping apparatus.
264. Alfred Vincent Newton. Improvements in apparatus for manufacturing gas and coke.
265. David Collison. Improvements in the construction of shuttle skewers.
266. Henry Alfred Jowett, and Frederick William Jowett. Improvements in apparatus for heating, which improvements are particularly applicable for generating steam or evaporating solutions, and may be applied for heating purposes generally.
267. Thomas Barker Walker Gale, and Jonathan Fensom. Improvements in the means of joining or coupling bands or straps.
268. William Crosby. Improvements in the ventilation of coal-pits and mines, ships' rooms, and buildings generally.
269. William Vaughan Morgan. Improvements in the preparation of oils for the purposes of illumination and lubricating machinery.
270. John Grimes. An atmospheric freezing machine.
271. Joseph Westby. Improvements in twist lace machinery.
272. Joseph Hill. A machine for stamping metals and forging iron and steel.
273. John Frederick Chatwin. Improvements in the manufacture of brushes.
274. John Frederick Chatwin. Improvements in the manufacture of buttons.
275. Alphonse René le Mire de Normandy. Improvements in obtaining fresh water from salt water.
276. Francis Warren. Improvements in gas-burners.
277. Admiral the Earl of Dundonald. Improvements in coating and insulating wire.
278. William Adolph. Improvements in apparatus for warming and ventilating rooms.
279. James Clark. Improvements in weaving carpets and other fabrics, and in the machinery or apparatus employed therein.

Dated October 7, 1852.

280. William Bissell. An improved cramp, or improved cramps, for cramping floors, doors, and joiners' and ship work generally.
281. Samuel Perkes. Certain improvements in the mode of treating skins, hides, leather, and other manufactured and raw productions.
282. John Blair. Certain improvements in the manufacture of waddings, and in the machinery for making the same.
283. Thomas Greaves. Improvements in the method or means of obtaining and employing motive power.
284. George Simpson. Certain improvements in machines or apparatus for weighing.
285. Edwin Pettit, and James Forsyth. Improvements in spinning and drawing cotton and other fibrous substances, and in machinery for that purpose.
286. Auguste Edouard Loradoux Bellford. An improvement in smoothing-irons.
287. Auguste Edouard Loradoux Bellford. Improvements in steam boilers.
288. Augustus Waller. Improvements in the means of measuring or ascertaining the quantity of Alcohol and other substances in brandy, wine, beer, and other liquids.
289. John Tatham, and David Cheetham. Improvements in rollers or bosses used for drawing or conveying textile materials and fabrics.
290. William Horsfield. Improvements in splitting, crushing, and grinding corn, seeds, grain, minerals or other substances.
291. Morris Lyons. Certain improvements in coating the surfaces of iron.
292. Samuel Rainbird. Improvements in grappling and raising sunken vessels and other submerged bodies, and in apparatus for that purpose.
293. John Little. Improvements in ash-pans for fire-grates, stoves, and fire-places.
294. Mitchel Thompson. Improvements in lamps, and in the production of artificial light.
295. Peter Ward. Improvements in the manufacture of sal-ammoniac and obtaining salts of ammonia.
296. Alfred Trueman. Improvements in obtaining copper and other metals from ores or matters containing them.
297. Alfred Kent. Improvements in glazing.

Dated October 8, 1852.

298. Edward Joseph Hughes. An improved method of purifying and concentrating the colouring matter of madder, munjeet, and spent madder.
299. Thomas Pascall. Improvements in ridge tiles and roofing.
301. Samuel Smith. Certain improvements in looms for weaving.
302. William Townley. Improved machinery or apparatus for watering and flushing streets, squares, courts, and other localities.
303. George Tillett. Certain improvements in bedsteads.
304. John Patterson. Improvements in buckles or fastenings.
305. John Talbot Tyler. Improvements in hats, and in the preparation of plush or other covering used in the manufacture of hats.
306. John Talbot Tyler. Improvements in velouring-machines, or machines used by hatters for causing the covering of hats to adhere to the body, and for polishing the nap of hats.
307. George Ennis. Improvements in dredging-machines.
308. John Lewthwaite. Improvements in cards, and tickets, and in machinery for cutting, printing, numbering, and marking cards, tickets, and paper.
309. James Yule. An improved arrangement of sawing machinery.
310. William Edward Newton. Improvements in the construction of hydraulic rams.

Dated October 9, 1852.

311. Auguste Edouard Loradoux Bellford. Improvements in apparatus for manufacturing soda-water and other aerated liquids.
312. James Bird. A new manufacture of cement.
313. John Egan. A self-acting flax scutching and hackling-machine with horizontal blades or hackles, an incline plane on which flax-holders move, the application of the fan by a current of air to press flax against scutching blades or hackles and spring catch flax-holders, as per drawing.
314. Richard Husband. Certain improvements in weaving hat plush and other textile fabrics.
315. Alexander Clark, and Patrick Clark. Improvements in the manufacture of shutters, doors, and windows.
316. Antoine Burg. Certain instruments, apparatus, and articles for the application of electro-galvanic and magnetic action for medical purposes.
317. William Scolfield, and Joseph Pritchard. Improvements in steam boilers.
318. William Maddick. An improved method of extracting and concentrating by evaporation the colouring and other principles from all substances in which they are contained, and of thoroughly exhausting the same.

319. James Johnson. Improvements in heating, ventilating, and sewering cottages or dwelling-houses.
320. John and William Smith. Improvements in the method or process of dyeing woven or textile fabrics certain colours, and in machinery or apparatus employed therein.
321. Samuel Hardacre. Improvements in machinery or apparatus for blowing, scutching, opening, cleaning, and sorting cotton, wool, and other fibrous substances, parts of which improvements are applicable to other purposes.
322. George Gent. A fruit cleaning and dressing machine.
323. Jean Jemot Rousseau. Improvements in inlaying and ornamenting metal plates to be used for door plates, sign plates, and other purposes to which such inlaid or ornamented plates may be applicable.
324. Thomas Restell. Certain improvements in chronometers, watches, and clocks, part of which improvements is applied to roasting jacks.
325. John Henry Johnson. Improvements in composing and distributing type.
326. Charles William Siemens. Improvements in engines to be worked by steam and other fluids.
327. Jonas Lavater. Improvements in the apparatus for measuring the inclination of plane surfaces and angles formed or to be formed thereon.
328. William Hine. Improvements in machinery applicable to paddle-wheels, windmills, and other useful purposes.

Dated October 11, 1852.

329. Auguste Edouard Loradoux Bellford. Improvements in the construction of revolving or repeating fire-arms.
330. Henry Moorhouse. Improvements in machinery or apparatus for cleaning woollen, cotton, or linen rags and waste, which machinery or apparatus is applicable to cleaning and tempering clay, or other similar purposes.
331. David Laidlaw. Improvements in the manufacture or production of gas burners.
333. George Searby. Improvements in machinery for cutting, carving, and engraving wood, stone, metal, and other suitable materials.
334. George Searby. An invention of the cure of smoky chimneys, and the prevention of accumulation of soot in flues.
335. Robert Cochran. Improvements in kilns.
336. Charles Matthew Barker. Improvements in sawing wood.
337. Henry Mac-Farlane. Improvements in stoves or fire-places.
338. Robert Lambert. Improvements in tents.
339. Andrew Edmund Brae. Improvements in the means of, or apparatus for, exhibiting numbers, letters, dates, or other devices for various purposes.
340. Henry Dewy. Improvements in disengaging ships' boats from their suspending chains or ropes.

Dated October 12, 1852.

341. Edward Simons. Improvements in lamps.
342. Francis Alexander Victor Michel. Stereotyping in copper by the galvanoplasty.
343. John William Couchman. The closing and hanging of swing and other doors, by means of the spring and pivots.
346. Samuel Perkes. Certain improvements in mines, buildings, and sewerage for effecting sanatory purposes, and treating the produce therefrom.
348. Joseph Humphreys. Improvements in metallic and other designs for exhibition in or on shop and other windows and places.
349. Emanuel Wharton. Certain improvements in metallic bedsteads.
351. Louis Constant Alexandre Vittrant. Improvements in the preservation of vegetable and animal matters.
352. Thomas Dawson. Improvements in the means of cutting pile or terry fabrics.
353. Thomas Lacey. Improvements in apparatus for raising liquids, and in joints for uniting India-rubber and other like flexible tubing.
354. Joseph Walker. Improvements in machinery for crushing and bruising malt, grain, and seeds.
355. Peter Warren. An improved material, applicable to many purposes for which papier maché and gutta percha have been or may be used.
356. Joseph Robinson. Improvements in ventilators.
357. Thomas Barnabas Daft. Improvements in inland conveyance.
358. William H. Smith. Improvements in the manufacture of lava ware.
359. Léon Godefroy. Improvements in covering or packing rollers for printing fabrics.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette" of Oct.* 19, 1852.)

1. Robert Adams. Improvements in ball cartridges.
2. George Henry Brockbank. Improvements in upright pianofortes.
5. Josua Smith. Improvements in table knives.
6. Moses Poole. Improvements in the manufacture of guns and pistols.
9. George Green. Improvements in the manufacture of casks.
10. Freeman Roe. Imrovements in valves and cocks.
11. Thomas Wood Gray. Improvements in cocks and valves.
13. Edward Lambert Hayward. Improvements in lock spindles.
14. Thomas Christy. Improvements in weaving hat plush, and other piled fabrics.
15. Joseph Barker. Improvements in fastenings.
16. Moses Poole. Improvements in the manufacture of telescope and other tubes.
17. Charles Henry Newton and George Leedham Fuller. Improvements in protecting electric telegraph wires.
19. Moses Poole. Improvements in moulding articles, when India-rubber combined with other materials are employed.
20. Charles Frederick Bielefeld. Improvements in constructing portable houses and buildings.
21. George Duncan and Arthur Hutton. Improvements in the manufacture of casks.
22. Henry Walker Wood. Improvements in the construction of ships and other vessels.
24. Moses Poole. Improvements in making covers for, and in binding books and portfolios, and in making frames for pictures and glasses.
26. John Macintosh. Improvements in evaporation.
28. Moses Poole. Improvements in coating metal and other substances with a material not hitherto used for such purposes.
29. John Daniel Ebingre. Improvements in the manufacture of animal charcoal.
30. Moses Poole. Improvements in the manufacture of trunks, cartouch and other boxes, knapsacks, pistol-holsters, dressing, writing, and other cases, and sword and other sheaths.
31. John Dunkin Lee. Improvements in covering railway trucks and other vehicles.
33. Moses Poole. Improvements in the manufacture of pails, tubs, baths, buckets, measures, drinking and other vessels, basins, pitchers, and jugs, by the application of a material not hitherto used in such manufactures.
34. Robert Beart. Improvements in the manufacture of bricks and other articles through moulding orifices.
36. James Hare. Improvements in expanding tables and music stools.
37. Moses Poole. Improvements in covering and

sheathing surfaces with a material not hitherto used for such purposes.

39. Felix Abate, and John Julius Cléro de Clerville. Improvements in preparing, ornamenting, and printing on surfaces of metal and other substances.

40. Frederick Richard Holl. Improvements in watches and chronometers.

41. Joseph Barrans. Improvements in steam-engine boilers.

43. Moses Poole. Improvements in harness, and in horse and carriage furniture.

46. James Stewart. Improvements in the action of pianofortes.

47. Stephen Perry. Improvements in inkstands or inkholders.

48. Edmund Morewood and George Rogers. Improvements in rolling metals.

49. Edmund Morewood and George Rogers. Improvements in coating metals.

51. Thomas Craddock. Certain improvements in the steam engine and the steam boiler.

57. John Joseph Macdonnell. Certain improvements in the construction of railways.

59. Marcus Davis. Certain improvements in the manufacture of carriages, carts, military and other wagons, and wheels for locomotive and other purposes.

70. Robert Lakin and William Henry Rhodes. Improvements in machines for spinning and doubling cotton and other fibrous substances.

77. Stephen Soulby. Improvements in machinery for letter-press printing.

78. William Smith. Improvements in machinery or apparatus for cleaning currants, raisins, and other fruits or vegetable substances.

79. Henry Smith. Improvements in reaping-machines.

80. Matthias Walker. An improved ash-pan or apparatus for taking up ashes and cinders, and separating or sifting them.

81. Frederick Osbourn. A machine or apparatus for facilitating the manufacture of various kinds of garments or wearing-apparel.

88. George Holcroft. Certain improvements in steam engines.

108. Thomas Fearn. Certain improvements in ornamenting metallic surfaces, and in machinery and apparatus to be employed therein.

112. Hermann Turck. Improvements in packing goods.

117. John Wilson Fell. Improvements in preparing and spinning hemp and other fibrous materials, for the purpose of making ropes, twines, and other similar articles.

120. George Collier. Improvements in the manufacture of carpets and other fabrics.

121. John Lee Stevens. Improvements in furnaces.

122. Duncan Bruce. Improvements in rotary steam engines.

123. Richard Whytock. Improvements in the manufacture of fringes, and of pleat for these and other ornamental work.

124. Richard Husband Heighway. Improvements in paving roads and other surfaces.

125. Thomas Hunt. Improvements in fire-arms.

128. William Rogers. Improvements in studs, buttons, and other fasteners.

129. Joseph Cox. Improvements in the manufacture of gates and hurdles.

130. Isaac Westhorp. Improvements in grinding wheat and other grain.

136. William George Nixey. Improvements in tills and other receptacles for money.

137. Arthur Jackson. Improvements in gas-burners.

138. Richard Atkinson Peacock. An improved construction of culverts for sewers for the purposes of drainage.

141. Astley Paston Price. Improvements in the manufacture of citric and tartaric acids, and of certain salts of potash, soda, ammonia, lime, and baryta.

(From the "London Gazette," Oct. 26, 1852.)

3. Peter Spence. Improvements in obtaining power by steam.

32. William Pym Flynn. Improvements in paddle-wheels.

38. The Honourable William Erskine Cochrane. Improvements in unloading coals from ships or vessels.

62. John Sayers. Improved arrangements for maintaining a level surface, or level surfaces, upon, or in connection with bodies subject to a rocking motion.

96. Henry Bridson. Improvements in machinery to facilitate the rinsing, washing, and cleansing of fabrics, which machinery is also applicable to certain operations in bleaching and dyeing.

97. John Macmillan Dunlop. Improvements in the manufacture of wheels for carriages.

99. Robert Anderson Rust. Improvements in pianofortes.

115. Charles John Carr. Improvements in machinery for making bricks and other similar articles.

116. William Bolivar Davis. Improvements in ships' buoys, life buoys, ships' fenders, and other similar articles.

127. Robert Whipple Parker. A new or improved mode of giving rotatory motion to a shaft of a circular saw, or other mechanical contrivance.

135. Robert Griffiths. Improvements in apparatus for indicating the number of persons entering and the distance travelled in public or other conveyances and places, and for the prevention of fraud upon proprietors of public conveyances.

150. Thomas Boyd. Improvements in the treatment or finishing of woven fabrics.

151. David Wilkinson Sharp. Improvements in machinery for combing and drawing a sliver of wool, flax, silk-waste, and other fibrous substances, and in apparatus for constructing screws to be used in a part or parts of such machinery.

162. John Ignatius Fuchs. An electro-magnetic apparatus.

163. Moses Poole. Improvements in the manufacture of tables, sofas, bedsteads, stands, chairs, and other articles of furniture, and the frames and bodies of musical instruments.

164. John Robert Johnson. Improvements in fixing colouring matter of madder in printing and dyeing.

167. Joseph Paulding. Improvements in machinery for sawing and cutting wood and other substances.

168. John Macintosh. Improvements in compositions to be used as paints.

169. Moses Poole. Improvements in machinery for mowing and reaping.

182. Samuel George Archibald. An improved mode of extracting or rendering animal fats and oils.

184. Joseph Needham. Improvements in breech-loading fire-arms, and in apparatus connected therewith.

187. Alexander Miller. Improvements in the treatment or finish of textile fabrics and materials.

188. John Weems. Improvements in obtaining and applying motive power.

190. James Anderson Young. Certain improvements in dental operations, and in apparatus or instruments to be used therein.

195. George Stuart. Improvements in treating the fleeces or natural coverings of sheep and other animals when on the animals.

201. Martin Watts. Certain improvements in machinery or apparatus for roving or preparing cotton and other fibrous substances for spinning.

203. Robert Hazard. A calorific bath.

206. John Moseley. Certain improvements in

machinery for cleansing linen and other fibrous materials.

212. Thomas Slater and Joseph John William Watson. Improvements in the application of electricity to illuminating purposes.

214. Thomas Kennedy. Improvements in obtaining and applying motive power, which improvements, or parts thereof, are applicable to timekeepers and clockwork, and for measuring and registering the flow of water and other fluids, and æriform bodies.

215. John Erskine. Improvements in the manufacture of felted and cemented fabrics.

225. Joseph Apsey. Improvements in shipbuilding and in machinery for propelling.

228. William Edward Newton. Improvements in machinery for boring or cutting rocks or other hard substances, for the purpose of tunnelling through mountains or making other excavations.

229. William Edward Newton. Improvements in the means of producing a vacuum for various purposes, such as condensing steam, pumping water, exhausting air, or other purposes where a vacuum is required.

232. John Prestwich the elder, Samuel Prestwich, and John Prestwich the younger. Improvements in machinery or apparatus for cleaning and finishing woven fabrics.

233. William Crook. Improvements in looms.

243. Samuel Getley. Improvements in water-closets.

244. Joseph Westby. Improvements in machinery applicable to the manufacture of lace and other weavings.

245. William Dray. Improvements in machinery for reaping and mowing.

246. George Hallen Cottam. Improvements in chairs, sofas, and bedsteads.

247. Christopher Nickels and Frederick Thornton. Improvements in weaving.

255. John Crook and John Wilkinson Wood. Certain improvements in the method of preserving hoop iron from oxydation or decay.

308. John Lewthwaite. Improvements in cards and tickets, and in machinery for cutting, printing, numbering, and marking cards, tickets, and paper.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed within twenty-one days from October 19, by leaving at the Commissioner's office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

Auguste Chesneau. The manufacture of an indestructible paving. October 12.

William Chisholm. Improvements in the purification of gas, and the obtention of certain products during the process of such purification. October 14.

George William Lenox. Improvements in machinery for raising and lowering cables and other chains. October 18.

William Roberts. Improvements in machinery for stopping and lowering cables and other chains. October 18.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Robert McGavin, of Glasgow, Lanark, North Britain, merchant, for improvements in the manufacture of iron for shipbuilding, October 23; six months.

Henry Needham Scrope Shrapnel, of Gosport, for improvements in extracting gold and other metals from mineral and earthy substances. October 23; six months.

James Lamb, of Kingsland, Middlesex, gentleman, and Joseph Menday, of the same place, engineer, for improvements in the construction of kilns for burning or calcining cement, chalk, limestone, and other substances requiring such process, and in the application of the heat arising therefrom to the generation of steam. October 23; six months.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Oct. 23	476	Thomas Allan	Adelphi-terrace	Battery plate-frame.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1526.] SATURDAY, NOVEMBER 6, 1852. [Price 3*d*., Stamped 4*d*.

Edited by R. A. Brooman, 166, Fleet-street.

PONTEZ'S NEW SUBMARINE FOUNDATIONS.

Fig. 1. Fig. 3.

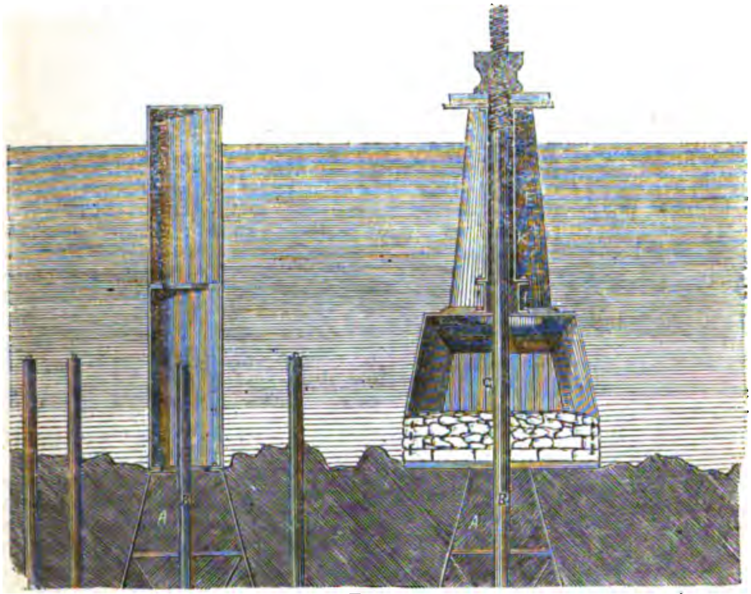
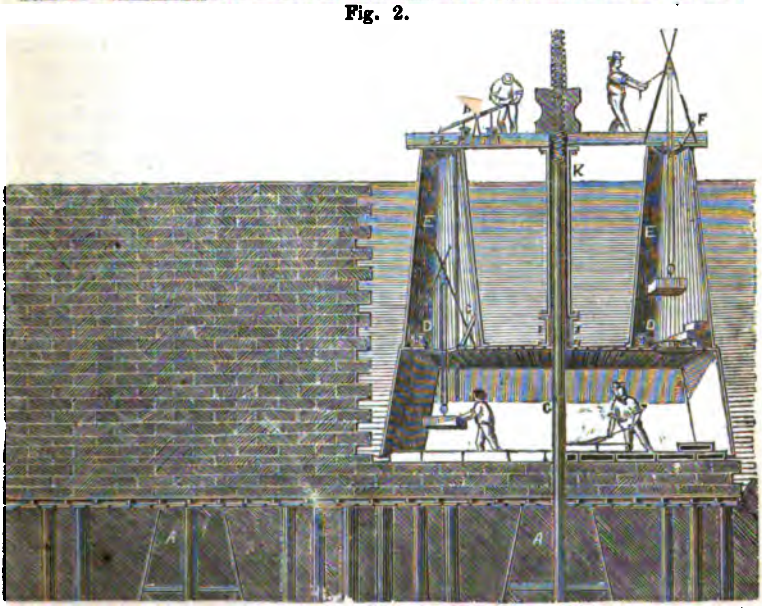


Fig. 2.



PONTEZ'S NEW SUBMARINE FOUNDATIONS.

THE accompanying figures exhibit an improved mode of constructing submarine foundations, the invention of Mr. Charles Pontez, of new York. By the method proposed by Mr. Pontez, the inherent difficulties, trouble, and expense of Hydraulic engineering are likely to be overcome by superseding the Diving-bell and Coffer-dam system entirely. Mr. Charles Pontez is the owner in America of the Patent obtained by Dr. Potts for sinking hollow piles and caissons by atmospheric pressure, and the ample opportunities which he has thus had of witnessing the efficiency of that principle of foundation-building, has induced him to turn his attention to its applicability to the construction of a continuous wall of masonry under water. By Dr. Potts' process, the operation of which we have so frequently admired, and which has worked its way with amazing rapidity on the other side of the Atlantic, iron cylinders of 10 feet in diameter, and even larger ones, have been sunk many feet below the surface of the water; and have thus formed admirable piers for bridges. Still, however, this is not a satisfactory attainment of that important object—a continuous subaqueous wall; for a space must necessarily remain unoccupied between each pair of cylinders. The inventor of this new method has ingeniously supplied the want which is here felt; and his method has this remarkable and important advantage, that it is applicable to localities in which coffer-dams could not be used.

In the engravings, fig. 1 shows a large iron cylinder sunk beneath the bottom of the water. A A A represent a series of these cylinders, placed exactly 20 feet apart, and which have already been built on. Fig. 2 represents a longitudinal section of an immerser coffer, with its shafts or entrances, and the guide-post in the centre. Fig. 3 shows a transverse section of the same. Suppose it is required to construct a continuous wall, 10 feet thick, and in water 20 feet deep; the operation would be commenced by sinking a cast-iron cylinder, 5 or 6 feet in diameter at its base, to a depth sufficient to secure its stability; it is then cleared of the soil within it. In the centre, at its base, is secured an upright iron post, which reaches a few feet above the level of the bottom of the water outside; the post has at its upper end a socket, which permits of its being lengthened. The cylinder is now filled with concrete to increase its density, and more fully to secure the upright in its place, so that whatever force may be applied, it cannot be drawn without dragging up with it the cylinder with its contents, and dislodging the superincumbent soil. Fig. 1 shows the cylinder and guide, B. That part of the cylinder above the level of the bottom is now detached, as shown in fig. 2. The immersive coffer with its guide-post, prevents its rising when immersed. This coffer may be made 20 feet long at its open end, and 6 feet high. Its width may be regulated by the required thickness of the masonry; in its top are two air-tight doors, C C, and two taps, D D; these open into the two shafts or ways, E E, each forming a distinct entrance to the coffer, they are elliptical in shape, and are larger at their bases than at their tops, which extend above the surface of the water when the coffer is immersed. The doors, F F, at the top of the shaft, are also air-tight; immediately in the centre of the coffer is a small hollow cylinder K, open at the top, having a stuffing-box, I, at its base where it is connected with the coffer. Through this the guide-post, B, passes. To secure the coffer in its position, it is floated immediately over the sunken cylinder, the guide-post, B, being passed through it, and securely screwed at the joint, G.

The coffer is made to sink by loading it, or by filling it with water by turning the taps, D D. The coffer is then secured to the guide-post at the platform, so that it cannot rise without dragging with it the guide-post and its connections. If the coffer has been filled with water to sink it, the taps are then closed and the water is expelled by forcing in air by means of the pumps, H. Materials are lowered, and ingress and egress are obtained to the coffer by the following means:—One of the shafts is filled with materials, into this the men descend and close the upper door, F; the air in the coffer below is of a density proportionate to the depth of water, and its sudden reduction, by opening the lower door, C, would cause the coffer partly to fill; this is obviated by opening the tap, D; at the same time the pumps support the density of the air in the coffer until it is equalized. The door is now opened, and the men descend to work. Whenever it is necessary to have a fresh supply of materials by a

like process, the contents of the other shaft are deposited, and so alternately one shaft is open for the reception of materials, while the contents of the other are being delivered below; and the work proceeds, and the courses of masonry are laid dry. When more space is required the coffer is allowed to rise a space along the guide-post; and so gradually the works continue, course by course, until the surface is reached, and the coffer floats. A small opening has been left in the masonry, around the guide-post, which is now withdrawn by unscrewing it at the point, G. The coffer is now floated to the next sunken cylinder, which is distant from its predecessor exactly the length of the coffer; the same operation is repeated, and the joints in the masonry, at each 20 feet, are made under the edge of the coffer.

This arrangement for building under the water differs essentially in the details from the diving-bell. To cause the diving-bell to sink, it must in itself, or by the addition of weight, be specifically heavier than a volume of water of equal bulk; to enable it to reach the surface it must be divested of a portion of its weight, or a power applied to it greater than the weight which caused it to sink, and on account of its great weight it must necessarily be circumscribed in size. One reason why operating with it is so expensive, is, that it requires the attendance of nine men, while only two can be operating on the work. The immersive coffer can be raised, lowered, or retained at any desired point—the means of controlling it forming a part of the structure itself.

It is obvious that this is an arrangement perfectly practicable, at least in situations where the depth of water does not exceed 30 feet; it now becomes a question as to the advantage it offers of convenience and economy. The cost of the immersive coffer would not greatly exceed the cost of constructing a section of a coffer dam enclosing an equal area, but it would serve the purpose of any number of such sections.

THE IMPORTANCE OF SELF-RIGHTING POWER IN LIFE-BOATS.

Sir,—The recent loss of life through the capsizing and non-righting of the Prize Life (?) Boats, has at last raised inquiry and directed attention to that most important qualification, "Self-righting power." Months ago, in my verbal and written communications to parties interested, I distinctly foretold the inevitability of such loss of life, the Prize Boat not possessing sufficient power to *right herself* with the necessary gear, much less with crew and passengers; we have it now proved, that, with two persons only in her, "she remained keel-up."

It may not be out of place here, to repeat a remark made to me some time ago by Mr. Palmer, sen. (the respected Deputy-chairman of the Royal Shipwreck Institution, and whose life-boats have been in use above twenty years), "that no boat can possibly right herself which does not possess the power of changing the centre of gravity upon coming keel-up; and no mode of effecting this change has yet been discovered."

In my patent, I claim to have discovered this desired power of changing the centre of gravity; my self-acting apparatus changing the centre of gravity to so powerful an extent, as to overcome the several obstructions to the righting of the boat; viz.; the suction, the lifting of one side of the boat over the centre, together with the gear and persons on board,—the mast and *sail even, if set;* in various experiments made before the highest naval authorities in the kingdom, I proved my position, as reported in your Journal in 1850.

These experiments were made upon the Serpentine, the boat (cutter rigged) had all sails set, was hauled down by the mast-head, till keel-up, and on being released, righted immediately. It should be recollected that the righting of a boat *in still fresh water*, is far more difficult than in the sea, from causes well known to nautical men.

It has often be inquired of me, why, as the accuracy of the principle of the boat has been proved on the more difficult "still fresh water," have you not built a larger boat and placed it on the

sea? I reply that, having already expended much time, and above 500*l.*, it is neither convenient, nor am I willing to expend 200*l.* more, seeing that I have not received the least encouragement.

I had intended to remain silent, but finding several writers still consider that a "righting power" is not yet discovered, I cannot refrain from troubling you with this communication, and exclaiming that *a sufficient self-acting righting power is discovered*, but is stifled for want of encouragement, and, possibly, interest; and that, in the meantime, our hardy sailors are exposed to farther danger in the misnamed life-boats.

I remain, most respectfully,
Your very obedient Servant,
W. W. BONNEY.

Victoria Villa, West Brompton,
Oct. 27, 1852.

M'GAVIN'S PREPARATION OF IRON PLATES FOR SHIP-BUILDING.

(From the *Glasgow Chronicle*)

The advantages of iron as a material for building ships, whether as respects economy, strength, stowage, or adaptation for fast sailing, are now universally acknowledged among shipowners. The proof of this is exhibited in the great number of vessels already constructed, or in process of construction, not only for coasting but for foreign trade. Indeed, but for one material drawback, there is reason to believe, that by this time, iron would have gone far to supersede timber entirely in the construction of ships' hulls. That drawback consists in the liability of iron, when immersed, especially in the seas and harbours of warm climates, to get covered with barnacles, and other growths hurtful to a vessel's sailing power. Different efforts have been made to overcome this difficulty, but they have hitherto been attended with but limited success. We are in hopes that a problem so important to the interests of commerce is now about to obtain a favourable solution through the ingenuity and patient experiments of a Glasgow shipowner. Mr. Robert M'Gavin, of the firm of M'Gavin and Thomson, has long had his attention directed to this subject, and has fallen on a method of preparing iron plates, by which there seems good reason to believe that the evil we have adverted to will be avoided. Plates prepared in conformity with this discovery have been subjected to severe tests. They have been sent, attached to ships' bottoms, on long voyages to various quarters of the world and through a great variety of latitudes. They have been nailed to the posts of jetties and wharfs in different parts of this country, and in all cases the result has been perfectly satisfactory. Yesterday we had the gratification of seeing two plates which have just been removed from a post of the wharf of the Holy Island, opposite Lamlash, where they have been exposed to the action of the sea for more than a twelvemonth. The one plate was of common iron, and the other of iron prepared according to Mr. M'Gavin's method. While the former, and the boards to which both were attached, are more or less covered with shells, the piece of prepared iron is entirely free from any attachment or growth whatever. The plates were also seen by several gentlemen belonging to the marine board for this port, who expressed in a document subscribed by them their gratification at the result of the experiment. Experiments conducted by an eminent professional chemist, and mechanical tests, have also been employed to ascertain whether the toughness of the iron is likely to be injuriously affected by the substance which is employed, and the result has been, not only to remove apprehension, but to induce a belief that the effect will be quite in an opposite direction. Mr. M'Gavin has already secured patents for the application of his discovery, and we suppose, will immediately take means for making its advantages known to those whom it chiefly concerns. In the meantime, we recommend such of our readears as are connected with ship-building and commerce to inform themselves on a matter which appears likely to bear so closely on their interests.

THE NEW TELEGRAPHIC LINE TO DOVER.

On Monday last, the new line of Electric Telegraph laid along the old coach-road to Dover, and connected at that place with the French submarine wire, was thrown open for public use. This line is the property of the European Telegraph Company, and it is quite independent of the South-Eastern Railway telegraphic line to the same port,—in comparison with which it is shorter and lighter, and will be worked at smaller expense to the public.

The Submarine Telegraph Company originated in a concession gained from the French Government chiefly through the exertions of Mr. Brett, and which was granted in 1849, to last for ten years, on condition that it was carried out at the end of October, 1851. It will be recollected that an experimental insulated wire was laid down across the Channel to test the practicability of the scheme, which answered the purpose and proved the thing was feasible,

though destroyed a few hours afterwards. Thereupon the Company applied to the public for money, but without effect, and several capitalists, who were asked for funds, also refused. Mr. Crampton, the engineer, then undertook to carry out the project; in doing which he risked not only his professional reputation, but incurred the chief pecuniary responsibility. The line was successfully laid down in time to save the concession. It has stood for a year, without the slightest deterioration, the action of sea-water, the storms of the Channel, the tides and currents, and even the purchase of a ship's anchor dragged across it in a gale of wind.

Mr. Brett was the contractor for the line from London to Dover. Mr. Crampton (with Mr. Wollaston) being the engineer, and Mr. F. Edwards, one of the Directors of the Company, and Messrs. Davis and Campbell, solicitors, carried out all the business arrangements in connection with the undertaking.

[We have extracted the foregoing article from the daily papers. In none of them does the name of Messrs. Newall and Co. appear. The omission of their name would appear to be intentional on the part of those who supplied the materials for the article. It is but due to them to remind the public that the submarine telegraph was manufactured by Messrs. Newall and Co., and that it is to their firm the public is in a great measure indebted for the means of telegraphing between England and the Continent. Whatever may be the defects of the system of insulation and protection adopted by Messrs. Newall and Co., the submarine telegraph manufactured by them is the only one which has answered all the purposes required, and which has stood the test of upwards of twelve months' work.—Ed. M. M.]

At 1 o'clock the offices of the Company were thrown open to all who took an interest in the proceedings. A great number of persons looked in during the day, which was close holiday on the Stock Exchange and on the Paris Bourse.

The French machine, invented by Breguet, whose name is so well known here, was worked in direct communication with Paris. The appearance of the instrument is attractive; instead of the dials, with double needles in the part of the indicating telegraph, there is a small black arm working in jerks from the centre of a white dial, so as to describe angles of 45° and 90°, with a fixed vertical line passing through the centre, performing, in fact, the action of a semaphore. The reason why this system was employed reflects some credit on the French government. It is well known that the semaphore system was very extensively used in France, and as the electric wires displaced these comparatively slow means of communication, the government, anxious that the *employés* under the old plan should not be thrown out of work, and that their skill and experience should be made subservient to the uses of the state, adopted this rotating arm on the dials of the telegraph, which perform *in petto* all the motions of the old semaphores or signal-posts with arms.

The French government had sent over this machine under the care of MM. Guichon and Deschay; but whether it was from the unfavourable character of the weather or some other cause, it did not seem very successful. It is also to be observed that this machine was worked by a very large galvanic combination, consisting, apparently, of 25 or 30 batteries of 12 couples each.

The completeness of the work, however, and the perfect character of the insulation between London and Paris, was satisfactorily attested by the transmission of a number of messages between the two capitals. The telegraphists at Cornhill, on the part of the Company, were Messrs. A. D. Evans and Banks; and at Paris, on the part of the French government, MM. Guichon and Deschay.

The following were the messages transmitted during the inaugural experiments:

From Paris to London.—"M. Foy, Director-General of French Telegraphs, presents his compliments to the Hon. F. Cadogan."

Shortly afterwards a message was received, "Foggy in Paris."

A message was transmitted from London to Paris:—"Strangers are visiting the London Office. Please send a few words." The answer was, "Wait."

In a very few minutes the following came from Paris:—"This day is very unfavourable for transmission between London and Paris. The atmosphere is very damp. We are to try a double-needle instrument in direct communication between Paris and London."

At ten minutes-past two (London time), the question was asked of Paris, "What time is it?" The answer was, "Ten past two, P.M."

A question was then asked of Arras, a French town between Calais and Paris, as to the state of the weather. The answer re-

ceived immediately was, "Overcast and dull."

The inquiry was made of the name of the transmitting clerk. The reply was "Brassard."

A further message was forwarded. "Lord de Mauley presents his compliments to M. Foy, and begs him to allow experiments with the needle instrument between Paris and London."

From Paris to London.—The rain and foggy weather of this day did not permit of the apparatus experiments between London and Paris taking place as favourably as we could have wished; but this single trial is sufficient to explain the facility with which direct correspondence can be established when the wires are perfectly right; the speed will then be augmented five times, and the two capitals will be able to communicate with each other instantaneously.

This was the last message sent to Paris to-day:

"The Directors of the Submarine Telegraph Company beg leave to approach his Highness the Prince President, with the expression of their best thanks for the assistance which he has uniformly given towards the establishment of this instantaneous means of communication between France and Great Britain.

"May this wonderful invention serve, under the Empire, to promote the peace and prosperity of the world.

"Dated Nov. 1, 1852,
"30, Cornhill, London."

It is unnecessary to add, that the greatest interest was taken by the Company in these satisfactory indications of the complete success of the undertaking.

The rate of telegraphing was 48 words per minute.

SUBMARINE TELEGRAPHS.

Sir,—In your article on Submarine Telegraphs, October 23, p. 328, you say a rope from Portpatrick to Donaghadee, "was to have been submerged two months back, *but has not yet been tried.*" If you will revert to the *Times* of the 18th inst., you will find a paragraph to the following effect:

"*Irish Submarine Telegraphs.* — On Saturday week Messrs. Newall and Co., the well-known wire-manufacturers, were, unfortunately, unsuccessful in an attempt to lay down a submarine telegraph cable between Portpatrick and Donaghadee, for the Magneto - Electric Telegraph Company. This is the more to be regretted, as the Contractors had got within about seven miles of the Irish coast, and were, when they found they could not reach the land, making arrangements to mark the end of the rope with buoys, when it slipped away from them, and sank in deep water."

To those not conversant with the subject, it would appear as if the rope had been about seven miles short,—not at all a likely miscalculation on so short a distance. May not the cause of the mishap be found in the *res gesta* of your article of the 23rd, viz., "The want of a proper *principle* at the outset as regards the *construction* of the rope and other details?"

My interpretation of the mishap is, that after the parties had got a portion of the rope submerged, they found that its essentials, as a conductor of electricity, had given way—either by disseverance of the copper wire, or the destruction of the insulation. It was therefore cut, it being unnecessary to lay down the remainder, which might have been perfect; and, in attempting to buoy it, so as to return and remedy the defects at a more suitable season, it slipped away from them, and now lies in deep water.

I am, Sir, yours, &c.,
AN ELECTRIC SPARK.

Portpatrick, Oct. 28, 1852.

NEW SUBMARINE TELEGRAPH ROPES.

A new and simple method of protecting Submarine Electrical Conductors has just been invented by Mr. Thomas Allan, of Edinburgh, a gentleman whose great practical ingenuity and skill have already achieved much in improving and facilitating our telegraphic system. According to Mr. Allan's design, the exterior protecting iron wires are placed longitudinally, instead of spirally, as is done in the Dover and Calais rope, and yet are quite flexible. By this means, about one-half the quantity of protecting wires will give a greater security against a longitudinal strain upon the copper conductors, than can be attained when the wires pass spirally around them. A submarine telegraph rope, constructed on this principle, will of course be less costly (probably one-half), while it will afford a better safeguard to the copper conductors, the mutilation or severance of which at once annihilates the circuit. No doubt a greater number of wires would better withstand the strain of a ship, should its anchor catch the rope; but when placed spirally, they must inevitably yield lengthways under any such strain, and so suffer the conductors to be snapped, and the communication entirely destroyed. We understand that this im-

provement will shortly be put to trial, and sanguine hopes are entertained of the entire success of the application.

MR. M'CONNELL'S EXPRESS ENGINES.

Some time ago we noticed the contract entered into between the Directors of the London and North-Western Railway Company and Messrs. Fairbairn, of Manchester, for the construction of a number of locomotive engines, designed by Mr. M'Connell, of Wolverton, for the attainment of high speed. The positive announcement that, before the end of the year the important town of Birmingham was to be brought within two hours' distance of the Metropolis, naturally excited great interest, and the construction of the engine has been watched with anxious attention, not only by its designer and constructors, but by the most eminent scientific and railway engineers. Messrs. Fairbairn have already completed the first engine, and at the preliminary trial, which was made at their establishment on Saturday last, the entire success of the novel principle was fully established. Without at present entering into a detailed description of this new application, its extraordinary effect will be understood by recording the fact that, within forty-five minutes of the time that the fires in the boiler were first lighted, a pressure of steam equal to 100 lbs. upon the square inch was indicated. The time required for this process in ordinary locomotives is nearly three hours. The calculated power of the new engine when running at a high velocity is not less than 650 horses! No doubt, we shall soon be called upon to report the actual performance upon the road of this new "Flyer," and the easy accomplishment of a long-sustained speed of 70 miles per hour, as another of the "great facts" of the age. In the meantime, a hint to the authorities of Euston-square to let us have on the day of trial a *clear road* and no favour may not be out of place.—*Times.*

COLLISION ON THE LONDON AND BRIGHTON RAILWAY.

A collision of a serious nature occurred on Monday morning last, at the Old Brighton Railway-station, Redhill, near Reigate, which was occasioned by the ten o'clock express train from Brighton running transversely into a "pick-up" train. The pick-up was being shunted from the down line to the up, prior to its being run into the siding, and by some strange neglect at the time, when the express was due. The engine and tender of the latter were crippled, the tender being torn from its bed and twisted round, and the solid timber on which it rested rent into small particles. Four of the carriages attached to the express train were much shattered on the side which came into collision. The first carriage, which was loaded with luggage, was greatly broken up, and looked as if a battery of grape had been poured into it. The debris of the pick-up were scattered about on all sides, and the ground between the rails of the up line was torn up for several hundred yards. One of the carriages of the pick-up was turned over and thrown off the line. Information was forwarded by the telegraph to London, and Mr. Edward Cock, head surgeon at Guy's Hospital, was sent down by special train to render assistance. In the meantime despatches were sent for Mr. Harris, Dr. Holman, and Mr. Steele, surgeons, from Reigate, and they promptly arrived. Considering the injuries sustained by the carriages, it seems extraordinary that no lives were destroyed. Many of the passengers received cuts and contusions, chiefly on the head and face, from the force with which they were thrown one against the other; but the only injury incurred of a serious nature was by a lady who resides at Regency-square, Brighton, who sustained a compound fracture of the leg, and was attended home by Dr. Holman. A large body of men, under Mr. Rigby, the contractor, were quickly set to work, and in the course of a short time rendered the line fit for traffic.

Four of the men, viz., James Clark, guard to the goods'-train; — Brewer, switchman at the goods'-station; Wm. Lamb, driver to the goods'-train; and — Hallows, stoker to the goods'-train, were apprehended and taken in custody to Reigate, where they were brought before J. W. Freshfield, Esq., chairman; A. Fraser, Esq., and Sir B. Brodie. Mr. Slight, secretary of the railway; Mr. Hawkins, superintendent of the goods' department; Mr. Acton, superintendent of the Company's police, were in attendance. Mr. Schuster and Mr. Nix, two of the Directors, were promptly at the scene of the disaster; and the parties having undergone a preliminary examination, were remanded upon bail, themselves in 50*l.* each, and two sureties each in 50*l.*—*Advertiser.*

LOCAL MUSEUMS OF ART.

We are glad to recognise in the following incident an evidence of the sincere desire of the Government to give their aid to institutions for the education of our artisans in ornamental design, in which, more than in

any other part of the arts and manufactures of this country, they may be considered deficient.

Some time since, the Local Committee managing the Macclesfield School of Art, published a copy of the catalogue of the casts, &c., of ancient statues and ornaments used as examples in the school, at the cost of the local committee of that place. This having been brought to the notice of the Board of Trade, a minute of the Board was passed, in which their lordships view this publication with general satisfaction, as affording at once a proof of the interest which the local committee of Macclesfield take in their school, and of their desire to make the collections known and useful, not only to students, but to the inhabitants generally of their locality. Their lordships consider, that by taking such measures to enlist the sympathy of all classes in works of art, sure foundations are being laid of obtaining for the benefit of the town more extended and complete collections of them, and so far as Parliament may place means at the disposal of their lordships, it will be their wish to encourage and assist, but not to supersede local efforts, in promoting art-education among the people, by means of collections of works.

After this declaration of an important principle, coupled with a former announcement of a willingness to contribute half the prime cost of examples, it remains to be seen how far Parliament will be disposed to grant the necessary funds to enable students to avail themselves of the opportunity.

THE MANUFACTURES OF BIRMINGHAM.

A letter from Birmingham, dated on Saturday evening last, informs us that the Britannia metal trade was tolerably brisk, though for some time past it had been in a very languid condition, owing partly to the introduction of articles manufactured from inferior and cheaper mixtures, and in some measure also to the use in the higher circles of the rich and highly-ornamented china articles of the potteries. At the extensive manufactory of Brown's, in Easy-row, some large orders were being executed for tea-pots, drinking cups, and other articles worked out of Britannia metal, chiefly for home consumption.

The brass-foundry business still continued active, notwithstanding the high price of the raw material, though it was evident the large orders were finding their way to the books of the principal houses, owing to the inability of small masters to produce the work on sufficiently advantageous terms to the purchaser.

In the ornamental and more costly branches of the business, a great number of men were now employed at the manufactory of Messrs. Hardman and Co., in making brass-work for several public buildings and private mansions. At the same manufactory the process of glass-staining was being carried on with great activity, and afforded constant employment to numerous stainers, and others engaged in this ancient branch of art.

The gun trade might be said to be in a prosperous condition, the numerous manufacturers in the town having abundance of work. The orders for pistols, particularly revolvers, had been unusually large, and the destination Australia and America.

The retail business done in this trade during the past six months had been most satisfactory, and the demand had been created by the great numbers who have proceeded to the gold regions of Australia and America. The orders received by the last arrival from Sydney were very encouraging, and the demand for almost every article of Birmingham manufacture was likely to continue. The trade with America was still limited, and far below the average. The orders received by the *Canada* were scanty, though hopes were entertained that a good winter trade would yet be done with the United States, unless the energetic and persevering efforts of our French neighbours should secure the orders which heretofore were regularly forwarded to this town.

ADMIRALTY BUNGLING.

It is now upwards of six months since it was decided that the *Royal Albert*, of 120 guns, building at Woolwich Dockyard, should be converted into a screw steam-ship. When the alteration from her original design, by Mr. Lang, as a sailing vessel only, was decided upon, it was intended by the Lords of the Admiralty, and Captain Sir Baldwin Walker, Surveyor of the Navy, that she should be merely fitted with auxiliary power, and that a pair of the engines in the Government stores should be fitted in her. Mr. Lang did not at first relish the idea that a magnificent ship, as the *Royal Albert* must have proved, being at the time 700 tons larger than any vessel ever built for the Royal Navy, should be converted into a screw steam-ship, and fitted with old engines to serve as auxiliaries only, that proposition being made by the authorities with a view to economy. After several consultations, it was considered that it would be more advantageous to have new engines, and Messrs. John Penn and Son were desired to furnish designs of engines of 600-

horse power, and an estimate of their cost, which was accordingly done, and it was all but finally decided that they should be put into the *Royal Albert*. A subsequent knowledge that the French Government were giving their vessels of the first class engines of the best make and most approved principles, with nearly, if not quite full power, caused the Admiralty to hesitate in their decision as to the power of the engines of the *Royal Albert*, the vessel in her present lines being unsuitable for engines of anything like the power a ship of her magnitude would require to propel her, even at a moderate rate of speed, through the water. It was, therefore, ultimately agreed that the matter should be referred to a Committee to report on the best means of making the *Royal Albert* an efficient screw steam-ship. The Committee have now concluded their labours, and their Report has been approved by their Lordships. A number of workmen were last week set to work on the *Royal Albert*, to make her water-tight up to some distance above the launch line of immersion, it being intended to have her ready for launching early in the spring of 1853. When launched, she is to be taken into the east dock, next the saw-mills, and will there be lengthened 35 feet, which will give her a capacity of upwards of 4,000 tonnage, and afford ample room for superior engines of 1,000 horsepower. The process of lengthening the vessel would have taken place where she is now building, but there is not room under the slip for that purpose.

THE DECIMAL SYSTEM INTRODUCED INTO THE WEIGHING OF BULLION.

On Saturday last the following notice was issued at the Bank of England:—"On and from Monday the 1st of November inst. the present mode of weighing in the Bullion-office of the Bank of England, by ounces, pennyweights, and grains, shall be discontinued, and the only weight in use at that office will be of the denomination of the troy ounce, and its decimal parts." This is another approximation to the decimal system of notation, the adoption of which will be the means of considerably simplifying our financial calculations, and towards which all alterations in the denominations of our coinage, and in weights and measures generally, must necessarily tend.

Professor Airy, in a letter to Mr. Alderman Humphery, of the 13th ult., thus speaks of the relative merits of the troy pound, and of the troy ounce, as the easiest of weights to be adopted in a decimal scale:

"But though I trust that this troy pound weight will be found, and will be carefully preserved, as likely to be in future a very valuable antiquarian monument, yet I hope that the use of the troy pound will not be encouraged in the offices of the City of London. It was established on abundant evidence before the standard commissions that the troy pound was useless, the troy ounce alone being used in trade; and for this reason, with others, the new standard weight of England will be an avoirdupois pound of 7,000 grains. It appears that new weights are now required for the City. I beg leave most strongly to urge on your attention the great advantage of adopting multiples of 10 ounces, 100 ounces, and 1,000 ounces. I heard very lately (as a matter which had occurred in my absence, and which I have not yet verified,) that the Bank of England have adopted this decimal scale from the ounce."

LAND-SLIP ON THE GREAT NORTHERN RAILWAY.

Early on Monday morning last, a land-slip occurred on the main line of the Great Northern Railway, in the Spittal-gate cutting, within a short distance of the place where a similar accident happened on the 13th ult. Since that time watchmen have patrolled the cutting day and night, to keep up a constant and vigilant inspection of the embankment, and to give timely notice of any probable casualty. The recent heavy rains, it is supposed, had loosened the soil, which is of a treacherous character, and on Monday morning, about an hour before the daily passenger traffic commenced, one of the men on duty observed the scarp next the up-line give way, and presently a considerable quantity of earth fell upon both lines of rails, completely blocking them up. Notice was immediately given to the stations above and below, and as soon as possible a large force of men was collected, and set to work to clear the obstruction. It was not expected, however, that this would be effected before Monday night or Tuesday morning. In the meantime, the through-passenger traffic between London and York, and *vice versâ*, was sent round by the loop line from Peterborough to Retford. The trains between Grantham, Stamford, &c., drew up at each end of the cutting, and the passengers were transferred from one side of the slip to the other, by a temporary road across the buried rails. The Chairman of the Great Northern Railway Company visited the cutting during the morning of Monday.

THOMSON'S ARTESIAN WELL-BORER.

The *Scientific American* of October the 10th, the last Number received in this country, contains the following account of a simple and useful contrivance for boring Artesian wells, which has been invented by Mr. John Thomson, of Philadelphia, and for which an American patent was granted on the 30th of March last:

A is a cylindrical iron bar, nearly filling the bore-hole, and about 5 feet long; to the bottom of which is attached the chisel for drilling. On the top of this cylinder, at D, is a swivel, with a square iron bar, about 4 feet long, and 1 inch each way, pass-

ing through an elliptical steel spring, and fixed to the rope B. The elliptical spring, E, is of four strips 18 ins. or 20 ins. long, and embraces the sides of the bore-hole in rock, the lower disc of which has a round, and the upper a square hole for the bar C to work in. There is a twist of about a quarter turn upon the upper end of the bar C, and a ring or shoulder, moveable at pleasure, is fixed upon it, and within the spring, as represented at F. The spring E acts as a brace by pressing outwardly, and remains in a fixed position while the machine is at work. Various methods may be adapted for working this apparatus either by manual power or otherwise, as all that is necessary is to raise and drop the machine about 18 inches, more or less, by means of the rope from the surface of the ground.

The figure in the engraving represents the machine suspended in the hole in the rock, having been raised a little; its operation is as follows:—The power from the top, by pulling the rope, lifts the whole, except the spring E (the bar C merely passing through it); but as C is a square bar, and the top disc of the spring has a square hole neatly fitting it; and as there is a twist upon that portion of the bar, the whole apparatus, except the spring, will turn round a portion of a circle when rising, in consequence of the twist upon the bar. Having thus raised it 18 ins., the shoulder on C, represented within the spring at F, will be near the top of the spring, and the next action is the drop, which must be done in the freest manner, when the weight A comes down exactly in the same position in which it was suspended, without in the least following the back course of the twisted bar, which merely resumed its former position in the fall. This straight drop of the heavy weight was obtained from the swivel D, for although that swivel lifts the weight, and bears it round with itself in the rising, it will be observed that there is no weight upon it whilst in the act of falling, as the bar C comes down as quickly as the bar A. In rising for the second stroke, the heavy cylinder with the chisel is swung round another portion of a circle by means of the twisted bar passing through the spring, and being suspended freely in the middle of the bore-hole, the drop is perpendicular and in the position in which it is hung. The spring is gradually carried down as the boring proceeds. According to the nature of the rock, the chisel will make any number of strokes or cuts for each revolution by shifting the shoulder, F, to another position upon the bar C, which allows more or less of the twist to pass through the spring.

To clean the hole, or boring, the machine is wound up by the rope to the surface and the cleaner substituted for the chisel.

A Committee of the Franklin Institute, Philadelphia, examined this machine at work last month, and reported that it was a great improvement on the Chinese mode of boring Artesian wells, and considered it the best instrument in use for that purpose. Any size of hole may be drilled with it, and it will work for a few feet in depth, or many hundred feet, by simply lengthening the rope. Any kind of power may be applied to work it, and a good machinist can easily construct one. The common chisels and cleaner are used, but are modified to suit the machine. The cleaning out of the hole is done rapidly, as there are no rods to detach, as in the common machine. The claim is for the spring brace and the twisted bar.

SOCIETY OF ARTS.

The Ninety-ninth Session of the Society of Arts will be opened at the Society's house, John-street, Adelphi, on Wednesday, the 24th of November. It was intended that the session should commence on the 17th, but circumstances connected with the funeral of the late Duke of Wellington rendered it necessary to postpone it at least a week. This arrangement will conduce to a great advantage in this respect, that as the Report of the Great Exhibition Commissioners is nearly prepared, and will be presented to Parliament on an early day, it will admit of a paper upon the results of the Great Exhibition, founded upon accurate statistical data, being drawn up and read.

The dates of the ordinary meetings of the Society, during its ensuing session, are as follow:

1852:	November ...	—	—	—	24	—
	December ...	1	8	15	—	—
1853:	January	—	12	19	26	—
	February	2	—	16	23	—
	March	2	9	16	23	30
	April	6	13	20	27	—
	May	4	11	18	25	—
	June	1	8	—	—	—
	July	6	—	—	—	—

THE NEW PATENT LAW AMENDMENT ACT. DINNER AT BIRMINGHAM.

On Wednesday last about 150 gentlemen, interested in patents, assembled at Dee's Hotel, Birmingham, to celebrate the passing of the Patent Law Amendment Act "over a good dinner." Among those practically acquainted with the nature and workings of patents were Mr. Muntz, M.P., Mr. Hindmarch, Mr. Webster, Mr. Prosser, &c., &c.

Mr. Muntz, in responding to the toast, "The Emancipation of Inventors," congratulated them on the great boon obtained by the passing of the new law, and promised his best assistance to any further measure that could be proposed for their benefit.

Mr. Prosser said he was not altogether satisfied with the concession already made, and he bade inventors look forward eagerly for the day when they should obtain patents for half a crown, and copies of specifications for one penny.

Mr. Hindmarch advocated the enrolment of the complete specification on receiving the grant of the patent.

Mr. Webster, on the other hand, contended that there should be a deposit of a mere outline description, leaving the specification to be enrolled six months after the grant.

As to whether a complete or provisional specification should be recorded on the grant of a patent, we do not now offer any opinion; but while on the subject, we cannot allow the opportunity to pass without pointing out the serious defect of the new law in granting a provisional protection, and afterwards subjecting the inventor to the trouble and annoyance of opposition before he can obtain his patent. The poor inventor has sufficient capital to obtain provisional protection; he exposes the whole of its details publicly in the hope of meeting with a capitalist to assist him in securing his patent, making models, &c.; and on his giving notice to the Commissioners of his intention to proceed with his patent, he is met by an opposition, which most probably will be found to arise out of the publication made in consequence of his supposed protection. He may evidently be subjected to great expense, and much trouble and annoyance, to prove himself the first inventor. Now, as a remedy, we would suggest that provisional protection should not be granted until the expiration of the time allowed for entering opposition; and we feel assured this is a modification which will speedily be effected.

With regard to Mr. Prosser's observations, we must say we hope, for the sake of the inventors themselves, that the day he is looking forward to may be very far off; for if patents are ever granted for so purely nominal a consideration, the market will be glutted, and they will become valueless. Let inventors be satisfied with their present position; for with some modifications, if we are not much mistaken, the new law will work well for their interests.

CORRESPONDENCE WITH LORD JOHN RUSSELL AND THE EARL OF DERBY, RELATIVE TO THE GOLD IN AUSTRALIA. BY FREDERICK SAMSON THOMAS. SECOND EDITION. EFFINGHAM WILSON.

In this correspondence the author has discussed with great ability, and with the advantage of abundant experience in the commercial nature of mining operations, the great points of our social organization, upon which, as is obvious to everybody, the recent discovery of gold in our Australian colonies must exercise an important influence. A subject of greater importance could scarcely have been brought under the notice of a Minister; and when treated in the manner we here find it, as a means of increasing the power of a Government for the benefit of the community in general, it assumes a degree of interest that assures us of its receiving attention in high quarters. Mr. Thomas insists, and very properly so, on the necessity of some legislative interference to determine for the future the extent to which gold-finding operations shall be carried, and the mode or restrictive system which ought to be adopted. He shows, conclusively, that any large undertaking, having the general object in view of working diggings in the colony for the benefit of persons at home, who are mainly interested, should not be left to the mercy of individuals whom the spirit of speculation brings forward, and who are almost certain to disappoint the expectations they encourage by their ignorance of geological knowledge, and incapacity of other kinds. Some rational test should evidently be required, as ruinous losses, widely spread through the public, must necessarily ensue, while these ignorant adventurers fill their own pockets. Another topic which Mr. Thomas elaborates, is one upon which some alarm has not unnaturally been expressed—the effect of large imports of gold in depreciating its value in our markets, thereby increasing the price of commodities, and exercising an injurious influence on manufactures in numberless ways. On this point, of cardinal consequence to our national ascendency as manufacturers for the whole world, the author has evidently bestowed much thought, and brought to his aid an extensive knowledge of public affairs. In his inference from these considerations, that it is necessary to limit the amount of the workings, and of our imports of Australian gold, we entirely concur, especially when we have regard for his exposition of the collateral inquiry into the staple branches of colonial industry. It is an established and universally-recognized fact in political economy, that the wealth of a nation does not consist in its stock of the precious metals, but in the extent, vigour, and health of its commerce. Now what a picture does the author present us with of the condition of the Australian pastoral interest! The wools of Australia have nearly displaced in our markets those of Spain; the rearing of sheep and the exportation of fleeces have grown in Australia to an amazing extent, finding the best employment for an industrial population of unlimited number, and promising to become the very staff and prop of the country. If the reader would know of its present state and prospects, and the connection of them with the gold-digging, let him read these letters; much good we conceive must be their result, and this good, at least, has been already accomplished—that this correspondence has elicited from Sir John Pakington the assurance that the Government had not granted special privileges to any one, or to any body of men, for working gold in Australia.

LAUNCH OF THE SCREW STEAMER "BENGAL."

The afternoon of Saturday (Oct. 30) being fine, a considerable concourse of spectators were attracted to Messrs. Tod and M'Gregor's building-yard, to witness the launching of the largest vessel ever built on the Clyde.

The preparations for the launch proceeded, as usual on such occasions, by the removal of the stays supporting the vessel; but at twenty-five minutes past two o'clock, ere the word of command could be given, or the dog-shores struck away, the immense structure began to move, those near it retreated out of the way, and the gallant ship slid majestically into the water without the slightest accident. As we have stated before, the *Bengal* is the largest vessel ever built at Glasgow, being about 10 feet longer than the *Great Britain*, although possessing neither the depth nor breadth of beam of that enormous steam-ship. The following are the principal dimensions of the *Bengal*:—Length on deck, 310 feet; length from figure-head to taffrail, 330 feet; breadth of beam, 30½ feet; depth, 28 feet; tonnage, 2,300 tons; engines, 470 horse-power. The appearance of this stupendous vessel afloat is very fine, and, fitted up with Lamb's patent engines, we have no doubt she will support the high character both for speed and other qualities of our Clyde-built ocean steamers. The screw of the *Bengal* is to be 14 feet diameter. Her cabins are all to be erected on the main deck, to suit the Indian

trade; and we are informed that the Peninsular and Oriental Company intend to run her in the Indian seas, for which tropical latitude every provision in the way of comfort and ventilation has been made in her internal arrangements.—*North British Daily Mail.*

MUSEUM OF PRACTICAL GEOLOGY. — GOVERNMENT SCHOOL OF MINES AND OF SCIENCE APPLIED TO THE ARTS.

The second session of this useful and highly successful Government Institution commenced on Wednesday last. The inaugural Lecture was delivered by Dr. Lyon Playfair, C.B., the subject being "Industrial Instruction on the Continent." The arrangements for the present session comprise 48 Lectures on Chemistry, by Dr. Playfair; 48 on Metallurgy, by Dr. Percy; 36 on Mechanical Science, by Mr. R. Hunt; 40 on Geology, by Mr. A. C. Ramsay; 48 on Natural History, by Mr. E. Forbes; and 76 on Mineralogy and Mining, by Mr. W. W. Smyth. We are glad to learn that the Institution has been attended with considerable success, and has already shown itself of great value, by the instruction which it has afforded to persons engaged in mining operations. Originally founded as a museum of practical geology, the sphere of its usefulness has become considerably enlarged, and instruction is at present afforded to matriculated students in all matters appertaining to mining operations similar to that afforded by the various schools and colleges in the mining districts of the Continent. The Educational Council of the school have also, since the late Great Exhibition, and in consequence of numerous memorials to the Royal Commissioners from the principal towns of the country, decided upon giving such instruction as should include all the more important applications of the sciences professed by the lecturers to the arts and useful purposes of life, and especially mining. The museum has been enriched with valuable collections, illustrative of the progressive stages of mineral manufactures, calculated to afford instruction to the students. The students of the respective schools are freely admitted for purposes of study to either establishment; and the Prince of Wales' Scholarship attached to the museum was taken in the last session, after a most severe examination, by a student of the School of Design. When it is considered that the raw material produced by the mining operations of the country exceeds in value 24,000,000*l.* annually, the vast importance of this noble Institution will be readily acknowledged.

The attendance at the Lecture, notwithstanding the exceedingly unfavourable state of the weather, was numerous, and comprised many of the most distinguished scientific men and artists of the day. Among those present were the Bishop of London, the Bishop of Oxford, Sir G. Pollock, Sir R. Murchison, Sir C. Eastlake, Sir Woodbine Parish, Sir J. Herschell, Sir C. Aldis, Sir R. Mayne, Mr. J. H. Vivian, M.P., Mr. F. Peel, M.P., Mr. Cardwell, Dr. Royle, Dr. Jelf, Dr. Paris (president of the Royal College of Physicians), Dr. Latham, Dr. Fitton, Dr. J. Conolly, Professor Hoskins, Professor Grove. Mr. Chadwick, C.B., Mr. H. Cole, C.B., Mr. Hardwick, R.A., Mr. C. Landseer, Mr. Leonard Horner, Mr. A. Milne, Rev. J. Jackson, M.A., Mr. Dilke, Mr. C. Walker, and several Turkish youths, who have been placed in the Institution by the Government of Turkey.

The learned Doctor's Lecture was admirably adapted to aid, and will certainly give a strong impetus to practical education of this sort, which in this country has unfortunately been too long neglected.

THE IRON TRADE.

By the most recent accounts from Birmingham, it appears that the extraordinary position of the iron trade is still a subject of considerable doubt and embarrassment, and for the interest of all parties engaged in it there exists a great necessity for its readjustment on some rational and satisfactory basis. It is now positively asserted, in well-informed circles, that another advance of 20*s.* per ton is contemplated, and that before next quarter-day this advance will be demanded. Most of the large houses are at present so full of orders as to render their execution impossible in the given time, and many of the proprietors are now refusing to add to their order books unless upon the understanding that they are to be paid whatever future prices may be declared within a certain period, and those time-bargains are made under the conviction that iron will be 10*l.* per ton before it is lower.

The orders for plates for ship-building are very large, for, although the increased cost of the material will ultimately affect the demand, the work now on hand must be executed, and the reports recently received from Scotland, of the prosperous state of the trade in that country, tends to strengthen the hopes entertained in this district. To add to the embarrassment of the trade there is evidently a deficient supply of coal, and, as usual, under such a combination of fortunate circumstances, the colliers are with

difficulty kept in work; nothing but demands for increased wages and "turn-outs" are talked of. In various places the men have given notices, and the masters will have to accede to their demand, or the great ironworks of the district will be brought to a stand still.

The royal mail steamer *Asia*, Lott, commander, which arrived at Liverpool on Monday last, with advices from America to the 20th ult., brings us accounts of the still advancing prices of iron in the markets of that country. The market for Scotch pig-iron continued to advance, owing to the light supply, and the small quantity known to be on the way. 1,500 tons of Scotch pig-iron had been sold at 28 dols. 50c. to 30 dols. cash.

English bar-iron had also advanced. It had brought 52 dols. 50c.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING OCTOBER 26 1852.

John Ridgway, of Cauldon-place, Stafford, china manufacturer. *For certain improvements in the method or process of ornamenting or decorating articles of glass, china, earthenware, and other ceramic manufactures.* Patent dated April 22, 1852.

Mr. Ridgway proposes to apply the process of electro deposition of metals to the ornamentation of ceramic manufactures generally. These articles being of a non-conducting material, it would not be possible to apply a permanent metallic coating, except some previous process were adopted, so as to cause perfect amalgamation of the coating metal with the article to be coated. This is effected by the use, firstly, of some porous glaze, or by rubbing the article until a high polish is obtained with a mixture of equal parts of sulphate of copper and plumbago. A coating of copper is then deposited by a galvanic agency, and the article after corrosion with hydro-fluoric acid is cleaned, and finally coated with the metal intended to be used to produce the required ornament. When this metal is silver, the coppered surface is immersed in a solution of nitrate of mercury, in order to produce a more perfect amalgamation of the two metals. Gold, platinum and other metals may also be deposited on the copper coating in like manner. The process of deposition is conducted by means of a galvanic battery in the manner usually practised.

Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. *For improvements in the method of manufacturing, and in machinery to be used in the manufacture of wood screws; part of which improvements is applicable to the arranging and feeding of pins and other like articles; and also improvements in assorting screws, pins, and other articles of various sizes.* (A communication.) Patent dated April 22, 1852.

1. Instead of shaving the heads of wood screws at a single operation, either before or after the nicking, the patentee proposes to shave the heads first to a more obtuse angle than they will be ultimately required to assume, then to perform the nicking, and then to finish the shaving operation, by which means the burrs produced during the nicking will be altogether removed without danger of breaking off any of the metal at the extremities of the nick.

2. A spring is interposed between the nipping jaws of the nicking machine and the cam which actuates the same, in order to adjust the jaws to various sized screws; and the jaws are caused to open slightly after having laid hold of the screw, and to close again before presenting it to the nicking saw, in order to permit it to assume a more favourable position for being acted on.

3. In manufacturing pointed screws, it is proposed to cut the screw blank to a pointed form, before commencing the threading operation.

4. The patentee describes an arrangement for cutting the threads of parallel-sided screws.

5. He describes another arrangement for the same purpose, particularly adapted for threading pointed screw blanks.

6. The feeding and supplying of screw blanks, pins, and other articles, is effected by an arrangement of apparatus provided with hooked fingers, by which the articles are seized, the heads of the same preventing their slipping from the hooks.

7. This branch of the invention includes a machine for assorting screws, &c., according to their lengths or diameters.

8. The patentee describes a machine for shaving the heads of screws, cutting the nicks, and re-shaving the heads, without removing the screws from the pair of jaws in which they were held during the first shaving operation.—Claims as above.

Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. *For improvements in the mode of priming fire-arms.* (A communication.) Patent dated April 22, 1852.

The present mode of priming fire-arms consists in causing pellets or balls of percussion material to be projected by a driver from a magazine formed at the rear of the nipple, so as to cover the nipple at the pre-

cise moment that the cock of the lock is falling, so that the descent of the cock shall cause the detonation of the priming or percussion balls. The driver is actuated by the mechanism of the lock, and is so arranged as to cover the exit orifice of the magazine at the moment of the discharge.

Claims.—1. The priming of fire-arms by projecting a pellet of percussion or priming material over the nipple at the time the cock is descending thereon, so that the priming shall be caught between the cock and nipple and exploded.

2. Combining the magazine and driver, or its equivalent, with the lock, in such manner that the mechanism by which the priming pellets are projected shall be actuated by the cock or moving parts of the lock.

WILLIAM HINDMAN, of Manchester, gentleman, and JOHN WARHURST, of Newton Heath, Manchester, cotton-dealer. *For certain improvements in the method of generating or producing steam, and in the machinery or apparatus connected therewith.* Patent dated April 22, 1852.

The patentees propose to generate steam by means of steam produced in a separate compartment of the same boiler, or in a detached boiler, and caused to circulate through chambers, flues, or tubes within the boiler containing the water from which the steam is to be generated.

Claims.—1. The producing or generating steam from steam, or the expansion thereof, and confining the same in manner described.

2. The construction of boilers with steam chambers, or steam flues or tubes.

RICHARD CHRISTOPHER MANSELL, of Ashford, Kent. *For improvements in the construction of railways, in railway rolling stock, and in the machinery for manufacturing the same.* Patent dated April 24, 1852.

1. The "improvements in the construction of railways" comprehend several compound rails, and forms of chairs, sleepers, and modes of sustaining rails at the joints.

2. The "improvements in railway rolling stock" have relation to the interior fittings of the seats of railway carriages, to the formation of railway wheels and tyres for the same, and to the combination of axles, axle-boxes, and wheels.

3. The "improvements in machinery for manufacturing the same," comprise an improved construction of saw-frame and boring-table for producing the naves of wheels.

ARMAND JEAN BAPTISTE LOUIS MARCESCHAU, of Rue de Moscow, Paris, France, gentleman. *For improvements in the mode of conveying letters, letter-bags, and other light parcels and articles.* Patent dated April 24, 1852.

The patentee proposes to effect the transmission of letters, letter-bags, and other light parcels and articles, by means of a sledge, of a light construction, supported and moving on the peripheries of a series of pulleys or drums, mounted in standards, set in a line between the points from and to which the parcels or articles are to be conveyed, and caused to revolve at a very high velocity by being geared together and driven from one or more suitable prime movers. By this means (according to the patentee's ideas) a speed of 200 miles or more per hour may be attained. Provision is to be made for directing the sledge and removing parts of its load at any required points.

Claims.—1. The conveyance of letters, letter-bags, and other light parcels and articles by means of the apparatus and vehicle described.

2. The construction of such an apparatus for conveying letters, letter-bags, and other light parcels and articles.

3. The peculiar form of vehicle to be used with the same.

WILLIAM CHURCH, civil engineer, and SAMUEL ASPINWALL GODDARD, merchant and manufacturer, and EDWARD MIDDLETON, manufacturer, all of Birmingham. *For improvements in firearms and ordnance, and in projectiles to be used with such or the like weapons; and also improvements in machinery or apparatus for the manufacture of part or parts of such firearms, ordnance, and projectiles.* Patent dated April 24, 1852.

These improvements comprehend,

1. A peculiar construction of breech-loading firearm. The moving portion of the breech turns vertically on two pins, and is held in position during firing, by a compound wedge at the back, which jams it against the fixed part of the barrel. The breech-piece is moved on its supporting pins by links connected with a lever, the handle of which is projected from the under part of the stock, immediately in front of the trigger-guard.

2. The application of a rifled tube to the interior of large plain bored muskets, so as to render the same serviceable as rifles, when no longer capable of being used in their original capacity.

3. A breech-loading cannon. Here the bore is clear through from breech to muzzle, and a couple of wedge filling pieces operated by a weighted lever, and working in a vertical slot, across the bore at the breech of the piece, are used to close the bore during the act of firing. In order to prevent the moving parts being deranged by the effects of the discharge, a disc of wood, of the exact diameter of the bore, is

attached to the rear of the cartridge, and this shields the wedge-filling pieces during the discharge. The gun being open at the breech, is sponged from behind, and thus is kept in a cool and firing condition longer than under ordinary circumstances.

4. The application of wings to the forward part of projectiles, such as elongated shot, shells, and rockets, to cause the same to maintain a motion of revolution round their axes during projection, and of spiral channels at the back-part of the same, to produce an initial motion of the same nature. In the cases of elongated hollow gun or rifle bullets, the patentees apply a washer of copper or a cup of some other metal, both of which are expanded by the explosion, and serve to fill the bore.

5. A mode of exploding shells and such like projectiles. A stem of metal passes from the rear into the charge, and has at its end the cap by which the charge is to be ignited on the shell striking; and another stem projects inwards from the front of the shell, so as to be almost in contact with the percussion cap. On the shell striking an object it is collapsed, and the forward stem driven forcibly against the cap, which is thereby detonated and the charge fired.

6. An improved construction of rifling machine, in which the cutting-tools have a vertical movement, and are guided by a pin on the cutter-bar working into a spiral groove in a cylinder, which encloses the bar of the same amount of twist as the rifling to be produced. The cutters are expanded between every stroke, and an axial motion given to the bar, so that no two cuts are made in succession by the same tool in the same groove.

7. A polishing, leading, and draw boring machine, for polishing or otherwise working the interior of the barrels of guns, pistols, and rifles. Here a piece of soft metal is attached to the extremity of a bar which is worked vertically interiorly of the barrel to be polished by means of a crank or eccentric. The barrel is sustained in a vessel containing emery-powder and lubricating material, which are drawn into the barrel after the bar at every period of its ascent, and the bar has an intermittent axial motion as well as a vertical one, in order to insure more perfect uniformity of the polished surface.

William Exall, of Reading, Berks, engineer. *For improvements in the process, composition, or combination of materials, machinery and apparatus for making bread and biscuits, part of which machinery is applicable to the mixing and kneading of plastic substances in general.* (Partly a communication.) Patent dated April 27, 1852.

1. The patentee proposes to make bread and biscuits from a combination of about equal parts of wheat flour, barley flour, or meal, bean flour, or meal and potatoes mixed thoroughly together, and slightly fermented, then baked in the form of small loaves or biscuits, which will be found to keep longer than ordinary bread, and to be more palatable than the common ship biscuits.

2. For kneading flour into dough, Mr. Exall uses a hollow screw, or spiral bar of iron, revolving in a cylinder or tube. The materials to be kneaded are supplied by a hopper at one end of the cylinder, which occupies a horizontal position, and forced out at the opposite end through a mouth-piece of any suitable form of orifice. This machine is specially claimed for making bread with the new combination of flours before described, and also for kneading clay and other plastic materials.

3. The kneaded dough, previously passed through a pair of roughing rolls, is placed on a feed-table, and supplied in a sheet of any desired thickness by a pair of rollers to a travelling web, which carries it successively under the operation of marking or stamping dies, and then under the cutters, each of which apparatuses has a reciprocating vertical motion, and by which the dough is stamped and cut into the form of biscuits. The latter are then removed from the travelling web, and transferred to the oven. Where the biscuits are round and cut to waste from the sheet of dough, the apparatus is so arranged as to separate the detached fragments, and prevent them going to the oven with the rest.

4. A new form of oven in described, in which the baking is effected in the interior of a series of horizontal tubes, set like gas retorts above a fire or in a flue, and open either at one or both ends, but provided with suitable doors for keeping the same closed during the operation of baking.

Specification Due, but not Enrolled.

Samuel Heseltine, the younger, of Harwich, Essex, gentleman. *For improvements in engines to be worked by air or gases.* Patent dated April 24, 1852.

Consumption of Oil in Locomotives.—A large railway engine consumes from 90 to 100 gallons of oil yearly for lubricating its working surfaces. The annual consumption of oil by the London and North-Western Railway Company, for this purpose, exceeds 40,000 gallons.

Royal Pension to Mr. Francis Ronalds.—Her Majesty has granted the annual pension of 75*l.* to Mr. Francis Ronalds, in con-

sideration of his eminent discoveries in electricity and meteorology.—*Athenæum*

The Craig Telescope. — We have reason to believe that discoveries of an important kind, with reference to the planet Saturn, have lately been brought to light by the Vicar's telescope; in fact, that the rings are not rings at all, but, in reality, arches of the most perfect geometrical formation; not of equal thickness, neither are they chamfered, but rather moulded off with angular, or terraced-like mouldings; and hence the appearance of the outer ring, consisting of several concentric rings. None of these rings are, it is conceived, since this fact has appeared through the Vicar's telescope, in the same plane.—*Leamington Spa Courier.*

Institution of Civil Engineers.—The ensuing Session of the Institution of Civil Engineers commences on Tuesday next, the 9th inst., at the house of the Institution, Great George street, Westminster.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 1, 1852.

68. George Ellins. An improved method or apparatus for preparing flax straw for dressing and cleaning.

Dated October 4, 1852.

199. Edwin Bates. Certain improvements for deriving motive power from expansive fluids, and the better application and economy thereof for propelling ships and other vessels in sea, river, and canal navigation, also in the shape and action of wind sails, the use of water as a motive power for driving machines, mills, &c., the construction of Turbine's air and water pumps, marine pumps for emptying ships of bilge water, and other useful purposes.

Dated October 6, 1852.

248. James Bird. A new artificial manure.

256. John Cronin Jeffcott. An invention for producing heat for generating steam, and applicable to and for other purposes for which this invention has not been hitherto used, under the name and title of a heat-producer and steam-generator.

Dated October 12, 1852.

344. Samuel Perkes. Improvements in certain apparatus and machinery for the production and treatment of mineral and other substances, and part of which are applicable for other useful purposes.

345. Samuel Perkes. Certain improvements in navigable vessels and propellers.

347. Auguste Edouard Loradoux Bellford. Improvements in sewing cloth and other materials.

Dated October 13, 1852.

360. George Lloyd. An improvement or improvements in the manufacture of paper.

361. Joseph Pimlott Oates. An improved spring, or improved springs, for carriages.

362. William Tatham. An improved mode, or improved modes, of preventing accidents on railways.

363. John Carter. Improvements in the manufacture of woven fabrics.

364. Matthew Smith. Improvements in machinery for weaving and printing.

365. Edward Lloyd. Certain improvements in steam engines, the whole or part of which improvements are applicable to other motive engines.

366. Joseph Nash. An invention of the treatment and refining of sugar.

367. Peter Armand Le Comte de Fontaine Moreau. A certain chemical combination for the silicatisation of calcareous matters.

368. William Walker Stephens. The application of retorts in gas ovens, or other ovens, to a process of improving iron, and converting iron into steel.

369. Thomas Suttie. Improvements in roasting apparatus.

470. Robert Pinkney. Improvements in cases for holding marking materials.

371. Walter McFarlane. Improvements in water-closets.

372. Richard Williams. An improvement or improvements in pumps or pumping.

373. Pierre Josephe Rousset Coquerelle.. The combination of certain chemical agents for the replacing of indigo and other blues, which combination he calls Rousset Blue.

374. Christopher Hill. Improvements in the manufacture of lubricating matters.

375. Gerard Andrew Arney. Improvements in coating or enamelling pictures, prints, paper, and other surfaces.

376. Henry McFarlane. Improvements in constructing metal beams or girders.

377. Martyn John Roberts. Improvements in galvanic batteries, and in obtaining chemical products therefrom.

378. Preston Lumb. Improvements in apparatus for cleansing coal.

379. John Henry Lee. Improvements in sawing.

Dated October 14, 1852.

380. Alfred Angustus De Reginald Hely. An improved waiter or tray.

381. Thomas Brown, and John Cox. Certain improvements in the mode of heating retorts or ovens for the manufacture of gas, and other distillatory products of coal.

383. Donald Grant. Improvements in the means of applying the heat derived from the combustion of gas.

384. Joseph Henry Tuck. Improvements in stuffing-boxes, and in packing to be used in stuffing-boxes, bearings, pistons, and valves.

385. Lous Rossi. An improved manufacture of muffs, boas, tippets, and other like articles.

386. John Duncan. Improvements in the treatment or manufacture of textile materials.

387. Joseph Major. An invention of removing spavins, ringbones, curbs, splents, and other unnatural ossifications and humours from horses, which invention he names Major's Celebrated British Remedy.

388. Alsop Smith. Improvements in the manufacture of fire-wood.

389. James Webster. Improvements in the construction of springs.

390. John Swindells, and William Nicholson. Improvements in obtaining oxygen gas, and applying it in the manufacture of various acids and chlorine, for oxydating metallic solutions, and for ageing and raising various colouring matters,

391. Eugéne André Boutarel. Improvements in ornamenting and apylying colour to fabrics.

Dated October 15, 1852.

392. Joseph Burch. Certain improvements in baths and bathing.

393. Joseph Burch. Certain improvements in building ships and vessels, and for the purposes of saving lives and property in cases of shipwreck or fire at sea.

395. John Gedge. An improved stove or heating apparatus.

396. James Lochhead, and Robert Passenger. Certain improvements in the manufacture of glass and other vitrified substances, and in ornamenting and annealing the same.

397. Henry Moseley. A machine to be driven by the pressure of a fluid, or to displace a fluid, or to measure it.
398. Hermann Turck. Improvements in propelling vessels.
399. Joseph Hopkinson. Improvements in steam boilers.
400. Simon Pincoffs, and Henry Edward Schunck. Improvements in the treatment of madder and other plants of the same species, and of their products, for the purpose of obtaining dyeing materials.
401. William Edward Newton. Improvements in washing and amalgamating gold and other metals.
402. John William Branford. Improvements in fire-escapes.
403. Jeremiah Driver, and John Wells. Improvements in moulding in sand and loam, for the casting of iron and other metals.
404. William Stevenson. Improvements in weft forks for power looms.
405. Allan Edwin Hewson. Certain improved modes or processes for making buttons, beads, and other ornaments of dress.
406. Andrew Blair. Improvements in printing and ornamenting fabrics.
407. Charles Henry Waring. Improvements in the cutting and working or quarrying of coal, stone, shale, clay, and other similar substances, and in machinery for that purpose.

Dated October 16, 1852.

409. Evan Leigh. Certain improvements in machinery or apparatus for carding cotton and other fibrous materials.
410. Lot Faulkner. Certain improvements in the method of obtaining motive power.
411. Jerome André Drieu. Certain improvements in weaving cloth, to be employed in the manufacture of stays.
412. John Howard. Certain improvements in the construction of steam-boilers or steam-generators.
413. Charles Tiot Judkins. Improvements in machinery or apparatus for sewing or stitching.
414. John Woods. Improvements in screw stocks.
415. William Beckett Johnson. Improvements in stationary steam engines.
416. Isaac Atkin. An improved machine for the manufacture of looped fabrics.
417. Pierre Augustin Puls. An improved chain or cable, and an apparatus employed therewith for certain applications.
418. John Henry Johnson. Improvements in the manufacture of sugar.
419. John Henry Johnson. Improvements in the manufacture and applications of hypo-sulphite and similar compounds of zinc.
420. John Oliver York. Improvements in connecting and in fixing rails in railway chairs.

Dated October 18, 1852.

421. Charles Reeves, junior. An improvement or improvements in the manufacture of knives.
422. George Randfield Tovell, and John Mann, junior. Improvements in the construction of ships and other vessels.
423. Samuel Fletcher Cottam. Improvements in quarrying slate.
424. John Henry Johnson. Improvements in drying, and in the machinery or apparatus to be used therein.
427. Auguste Edouard Loradoux Bellford. Improvements in the manufacture of fuel, part of which improvements are applicable to the manufacture of gas and soda, and freeing metals from extraneous substances.
428. John Campbell. Improvements in the treatment or finishing of textile fabrics and materials.
429. William Harcourt, and Joseph Harcourt. Certain improvements in the construction and manufacture of match-boxes.
430. Richard Archibald Brooman. Improvements in vices.
431. Henry Hughes, and George Firmin. Improvements in the manufacture of lamp-black, and in recovering from such manufacture a substance suitable for fuel.
432. Edwin Heywood. Improvements in looms.
433. John Lyons McLeod. Improvements in giving a metallic coating to iron ships' bottoms and other surfaces.

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434. Thomas William Greathead, James Hilliard, and John George Reynolds. An improved means of heating, cooking, and warming.
435. John Goodman. An improved fountain pen.
436. Robert Mole, and Robert Mole, junior. Improvements in the manufacture of swords and matchets.
437. Arthur James. An improvement or improvements in needle-cases or wrappers.
439. Martin Walter O'Byrne, and John Dowling. An invention of a machine for cutting paper, millboard, leather, vellum, sheet metals, and other suitable materials for useful and ornamental purposes.
440. Fennell Herbert Allman. Certain improvements in the manufacture and construction of brushes.
441. John Kealy. Improvements in machinery or apparatus for cutting or slicing roots.
442. William Newton. An improved machine for separating ores, metals, and other heavy substances, from mud, sand, gravel, stones, and other impurities.
443. William Chisholm. Improvements in obtaining caustic soda and other substances from the residues of articles used in the purification of gas.
444. Gabriel Benda. Improvements in apparatus for obtaining fire for smokers.
445. George Gotch. Certain improvements in transmitting intelligence upon railways.
446. Robert Bird. Improvements in the straining-webs of saddles.
447. George Gadd. Improvements in apparatus for roasting coffee.
448. James Otams. Improvements in the manufacture of manure.
449. John Jones. Improvements in handles for knives, razors, and other like instruments.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette" of Oct.* 19, 1852.)

258. David Chalmers. Improvements in looms for weaving wire web or cloth by power.
269. William Vaughan Morgan. Improvements in the preparation of oils for the purposes of illumination and lubricating machinery.
271. Joseph Westby. Improvements in twist lace machinery.
272. Joseph Hill. A machine for stamping metals and forging iron and steel.
273. John Frederick Chatwin. Improvements in the manufacture of brushes.
274. John Frederick Chatwin. Improvements in the manufacture of buttons.
275. Alphonse René le Mire de Normandy. Improvements in obtaining fresh water from salt water.
277. Admiral the Earl of Dundonald. Improvements in coating and insulating wire.
279. James Clark. Improvements in weaving carpets and other fabrics, and in the machinery or apparatus employed therein.
294. Mitchel Thomson. Improvements in lamps and in the production of artificial light.
295. Peter Ward. Improvements in the manufacture of sal-ammoniac and obtaining salts of ammonia.

296. Alfred Trueman. Improvements in obtaining copper and other metals from ores or matters containing them.
314. Richard Husband. Certain improvements in weaving hat plush and other textile fabrics.
320. John and William Smith. Improvements in the method or process of dyeing woven or textile fabrics certain colours, and in machinery or apparatus employed therein.
321. Samuel Hardacre. Improvements in machinery or apparatus for blowing, scutching, opening, cleaning, and sorting cotton, wool, and other fibrous substances, parts of which improvements are applicable to other purposes.
325. John Henry Johnson. Improvements in composing and distributing type.
327. Jonas Lavater. Improvements in the apparatus for measuring the inclination of plane surfaces and angles formed, or to be formed thereon.
331. David Laidlaw. Improvements in the manufacture or production of gas-burners.
335. Robert Cochran. Improvements in kilns.
352. Thomas Dawson. Improvements in the means of cutting pile or terry fabrics.
357. Thomas Barnabas Daft. Improvements in inland conveyance.
358. William H. Smith. Improvements in the manufacture of lava ware.

(*From the "London Gazette" of Nov. 2, 1852.*")

4. James Hodgson. Improvements in constructing iron ships and vessels.
8. Richard Wright. Improvements in constructing vessels.
42. Oswald Dodd Hedley. Improvements in getting coal and other minerals.
61. John Baylis. Improvements in hatbands and armlets.
73. Edward Wilkins. Improvements in ruling and folding the leaves of account-books or other books used for mercantile purposes, and in making entries therein, and delivering vouchers therefrom, with accuracy and dispatch.
85. Joseph Brandeis. Improvements in the manufacture of sugar and saccharine solutions.
98. Thomas Firth. Improvements in machinery for preparing to be spun wool, mohair, flax, cotton, and other fibrous materials.
102. George Rennie. An improved chain cable.
103. Charles Lungley. Improvements in ship-building.
152. Eugene De Varroc. Improvements in rendering glass reflective.
191. John Stringfellow. Improvements in galvanic batteries, for medical and other purposes.
207. William Donald Napier and William Lund. Improvements in apparatus for steering vessels.
211. Thomas Scott. Improvements in applying and transmitting motive power, and in accelerating the progress of bodies in motion.
221. William Crosskill. Improvements in machines for cutting or reaping growing corn, clover, and grass.
238. William Gilbert Elliott. Improvements in the manufacture of bricks, pipes, tiles, and other articles capable of being moulded.
248. James Bird. A new artificial manure.
256. John Cronin Jeffcott. An invention for producing heat for generating steam, and applicable to and for other purposes for which this invention has not been hitherto used, under the name and title of a heat-producer and steam generator.
276. Francis Warren. Improvements in gas-burners.
278. William Adolph. Improvements in apparatus for warming and ventilating rooms.
304. John Paterson. Improvements in buckles or fastenings.
312. James Bird. A new manufacture of cement.
315. Alexander Clark and Patrick Clark. Improvements in the manufacture of shutters, doors, and windows.

Opposition can be entered to the granting of a patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

Halsey Draper Walcott. A new and useful, or improved mechanism or contrivance for cutting button-holes or slits in cloth, or other material. October 26.

Frederick Richards Robinson. An improvement in the gridiron, or instrument for cooking steak or other articles by broiling. October 20.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Joseph Walker, of Dover, Kent, merchant, for improvements in treating cotton seeds, in obtaining products therefrom, and in the processes and machinery employed therein, parts of which improvements are applicable to distillation. (A communication.) November 2; six months.

Patrick M'Anaspie, of Liverpool, gentleman, for a new manufacture of Portland stone cement and other compositions for general building purposes and hydraulic works. November 2; six months.

John Crowther, of Huddersfield, York, for a self-acting hydraulic crane or engine for lifting weights, such weights when lifted to be used as motive power; as also for loading and unloading vessels and vehicles. November 2; six months.

LIST OF SCOTCH PATENTS FROM THE 22ND OF AUGUST TO OCTOBER 22, 1852.

Thomas Richardson, of Newcastle-upon-Tyne, for improvements in the manufacture and preparation of magnesia and some of its salts. August 26; six months.

James Warren, of Montague-terrace, Mile-End-road, gentleman, for improvements applicable to railways and railway carriages, and improvements in paving. August 26; six months.

Alexander Parkes, of Birmingham, for improvements in separating silver from other metals. August 26; six months.

Frederick Sang, of Pall-Mall, Middlesex, artist in fresco, for improvements in floating and moving vessels, vehicles, and other bodies in and over water. August 26; six months.

Joseph Denton, of Prestwich, Lancaster, gentleman, for certain improvements in machinery or apparatus for manufacturing looped, terry, or other similar fabrics. August 26; six months.

Joseph William Schlesinger, of Brixton, Surrey, gentleman, for improvements in fire-arms, in cartridges, and in the manufacture of powder. (Partly communication.) August 26; six months.

Alexander Stewart, of Glasgow, manufacturer, for improvements in the manufacture or production of ornamental fabrics. August 27; six months.

Sir John Scott Lillie, Companion of the Honourable Order of the Bath, of Pall-Mall, for certain improvements in the construction or covering o walls, floors, roads, footpaths, and other surfaces. August 31; six months.

Edmund Morewood, and George Rogers, of Enfield, gentleman, for improvements in the manufacture, shaping, and coating of metals, in applying that metal to building purposes, and the means of applying heat. September 6; six months.

George Wright, of Sheffield, and also of Rotherham, York, artist, for improvements in stoves, grates, or fire-places. September 11; six months.

Thomas Hunt, of Lemon-street, Goodman's-fields, Middlesex, gentleman, for improvements in fire-arms. September 13; six months.

Alexander Mills Dix, of Salford, Lancaster, brewer, for certain improvements in artificial illumination, and in the apparatus connected therewith, which improvements are also applicable to heating and other similar purposes. September 16; six months.

John M'Conochie, of Liverpool, Lancaster, engineer, for improvements in locomotive and other steam engines and boilers, in railways, railway carriages and their appurtenances, also in machinery and apparatus for producing part or parts of such improvements. September 20; six months.

Robert Burn, of Edinburgh, practical engineer, for a certain improvement in steam engines. October 6; six months.

Thomas Ellwood Horton, of Priors Lee Hall, Salop, iron-master, and Elisha Wylde, of Birmingham, engineer, for improvements in apparatus for heating and evaporating. October 12; six months.

Robert M'Gavin, merchant, for improvements in the manufacture of iron for ship-building. October 21; six months.

Joshua Crockford, of Southampton-place, Middlesex, gentleman, for improvements in brewing and in brewing apparatus. Sept. 2; six months.

Thomas Wilks Lord, of Leeds, York, flax and tow machine-maker, for improvements in machinery for spinning, pressing, and heckling flax, tow, hemp, cotton, and other fibrous substances, and for the lubrication of the same, and other machinery. September 2; six months.

Pierre Isidore David, of Paris, machinist, for certain improvements in the method of bleaching, and in the apparatus connected therewith. September 1; six months.

LIST OF IRISH PATENTS FROM THE 17TH OF SEPTEMBER TO OCTOBER 17, 1852.

Frederick Sang, of Pall-mall, Middlesex, artist in fresco, for certain improvements in floating and moving vessels, vehicles, and other bodies on and over water. September 28.

Thomas Ellwood Horton, of Priors Lee Hall, Salop, iron-master, and Elisha Wylde, of Birmingham, engineer, for improvements in apparatus for heating and evaporating. October 13.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Oct. 30	3380	W. Caldwell	Glasgow	Berth Settee.
Nov. 2	3381	G. Duncan, A. Hutton, and C. Thomas	Chelsea	Spring-holder Strap.
,,	3382	Clark and Timmins	Bloomsbury-street	Table Fasteners.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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Edited by R. A. Brooman, 166, Fleet-street.

GATLING'S PATENT SEEDING-MACHINE.

Fig. 1.

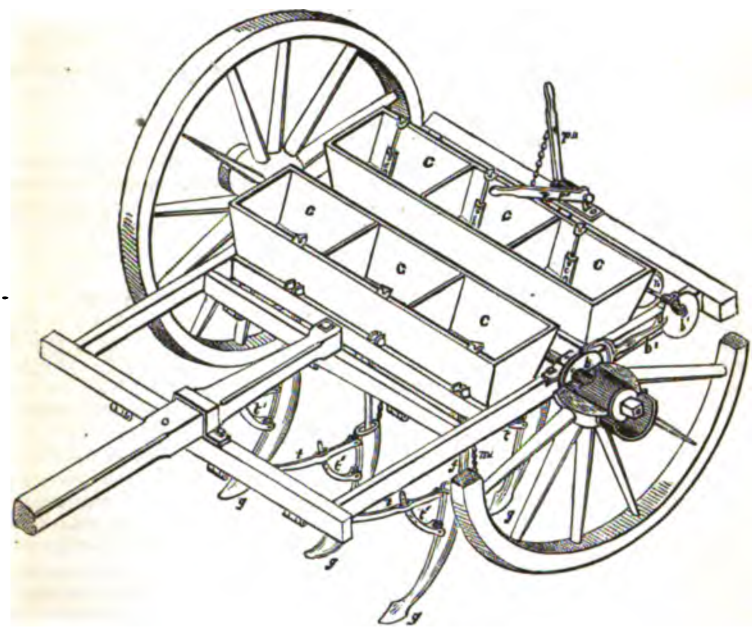


Fig. 3.

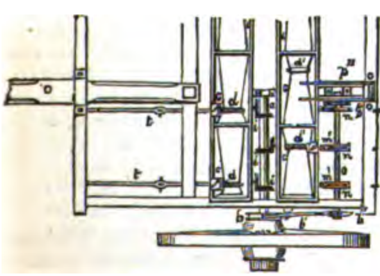
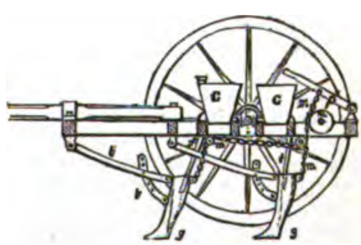


Fig. 2.



GATLING'S PATENT SEEDING-MACHINE.

(Patent dated May 4, 1852. Specification enrolled November 4, 1852.)

This machine is intended to be used for seeding, or depositing in the ground grains or seeds, and along therewith such manures as may be conducive to the germination thereof, as guano, bone-dust, &c. The machine consists of a carriage, upon which are mounted reservoirs, or hoppers, to contain the substance to be deposited in the ground, with the means of governing the feed or quantity to be distributed; and also the ploughs for opening the furrows as the machine progresses. There are also attached to the wheels and other parts appliances for regulating the depth of the drill, also for stopping and starting, raising and lowering certain parts to clear obstructions, and to avoid risk of injury. Fig. 1 of the engravings annexed is a perspective view of this machine; fig. 2 a vertical longitudinal section of it; and fig. 3 is a top view of one side, or half.

The wheels are attached to an axle, divided into two parts, so combined that each half axle can be made to revolve with its wheel, or not, at pleasure. This is effected by means of a clutch upon the axle near the nave of the wheel, which clutch may be put in or out of gear at will. Each axle extends to the centre cross-bar of the body of the machine, as seen at *a* (fig. 3). The clutch is at *b*, and is operated by a lever *b′*, coupled with a cam *b″*, attached to the regulating shaft at the back of the machine. The clutch moves upon a feather on the axle, and the coupling or uncoupling of the wheel is effected by sliding the clutch along, so that the stud shown upon it shall enter the opening in the nave fitted to receive it when the wheel and the axle are to revolve together, and be withdrawn when the axle is to remain stationary. The hoppers *cc* are more or less in number and size, according to the work to be done (as represented in the engravings); there are two sets of three in a set, arranged parallel to the axle, a set on each side. To each hopper there is attached a conveyor or spout *d*, and a mould-board or drill-plough. The spout consists of a spindle or shaft, having a spiral groove upon a part of it; which groove commences at one end, and may be continued rather more than halfway across the hopper. The conveyor lies in a channel at the bottom of the hopper (this channel is best seen in fig. 3 at *q*.) The spiral end terminates in an aperture in the front of the hopper, from which aperture the materials to be deposited in the ground are delivered. Over this aperture a valve *e* is fixed, capable of being contracted or enlarged as may be required. The opposite end passes through the side of the hopper, and terminates near the axle. On the end is a bevel wheel, which gears into a like bevel wheel placed upon the axle, as seen at *i i*—thus by the rotation of the wheel and of the axle, motion is imparted to the conveyors. The bottoms of the hoppers are inclined towards the conveyors, so as to cause the seeds to flow upon them from all points. At *f* is a spout of leather or other suitable material, which connects the hopper with the drill plough; of which it may be considered as an extension, the division being made for purposes of adjustment as described. In some cases the ploughs extend to the hoppers in one piece. The ploughs are of metal castings made hollow, the lower part terminating in the mould board, as shown at *g*. The interior or hollow part forms the spout to guide the seed from the hoppers to the drills, as indicated by the dotted lines, in fig. 2, from which it will be seen that the seeds drop through immediately at the heel of the mould board, the earth closing up immediately after and covering them. The ploughs are hinged to the frame of the carriage in such manner that they can be raised or lowered by the attendant, either singly or altogether; and different angles may also be given to them. The raising and lowering is effected by the chains *mm*, which are attached at one end to the ploughs, as shown; and after passing over sheaves, terminate at the back end of the machine, where they are fastened to the pulleys *nn*, placed upon the shaft *o*. This shaft lies parallel to the axles, and, like them, is divided into two parts, meeting at the centre framing. Near the inner end of each shaft is a pulley *p* (see fig. 3), which serves to give motion to the shafts for raising and lowering the ploughs. A chain passes round each, which is attached to handles *p′ p″*; a handle to each shaft. When the handles

are in the positions seen at p' (fig. 1), the ploughs are lowered into the ground. When in the position shown at p'', they are raised out of the ground, and may be raised still higher, to clear any obstruction, by carrying the handle over to rest against the back framing of the machine. In that position the wheels are thrown out of gear with the axles. The ploughs need only to be held up, and the machine may be driven to the field for operation. Either handle may be worked separately.

The raising or lowering of one of the handles operates upon all the ploughs on one-half of the machine; but there is also a provision by which each separate plough may be raised or lowered without operating the handles. The ends of the chains *m m* are not fastened to the pulleys *n* by a permanent attachment, but are held in place by rings, as shown at m^1 in the last link of the chain, the chain passing through a hole formed by a strap over the groove of the pulley, the enlargement caused by the ring holding the end of the chain in place. On the back cross strip are a series of hooks *r* opposite to each pulley *n*. When, therefore, it is desirable to raise a plough up by itself, the attendant draws the chain through the hole formed by the strap over the groove of the pulley, and puts the ring m^1 over the hook *r*. The object of raising a single plough is to avoid suspending the operation of one half of the machine for clearing a temporary obstruction in the way of a single plough, for by moving one or both of the handles to raise the ploughs, the wheels are also uncoupled from the axles, and the feed ceases. Now, although when a single plough is raised, the feed goes on, and, of course, is deposited on the surface of the ground, yet it is more economical to lose the grain from one drill than to lose the space in the ground of all the drills, were it necessary to raise all the ploughs to clear one of them. In addition to the chains for supporting the ploughs, there are also braces *t*, extending forward to the cross bars, as shown. From *t* a crutch t^1 extends to the shank, and is fastened a little below the main bearing. This crutch is graduated with holes to receive pins by which the distance between the points of support can be increased or diminished; and thus the angle of the ploughs can be varied at pleasure.

The mode of operating with the machine is as follows:—Everything being prepared, the machine is placed at the entrance of the field or plot of ground to be sown. The grain (say wheat) is put into the hoppers; the valves *e* are shut down so as to contract the delivery apertures to the proper degree for wheat. The attendant then carries the reins of the team to the back of the machine, following it as he drives along in a position ready to operate the handles or the chains, in case he perceives any obstruction. The rotation of the conveyors *d* causes the seed to be carried toward the mouth of the delivery apertures in a determinate quantity regulated by the speed and the size of the spiral grooves. The seeds falling through the spouts *f* are delivered in the drill in single grains, and at certain distances apart, thus depositing every grain exactly as it should be in order to insure the greatest yield, while the waste from the old mode of seeding is entirely avoided. In addition to cereal grains, this machine will plant cotton, as well as all descriptions of garden seeds, and will properly deposit various kinds of manures in the earth in the exact places required to produce the most beneficial effect.

The machine may be employed with advantage as a "cultivator," after the seed has vegetated, by running the ploughs between the drills.

THE PATENT LAW AMENDMENT ACT.

Sir,—The account, in your last Number, of the dinner at Birmingham to celebrate the emancipation of Inventors by the passing of the Patent Law Amendment Act, gives so imperfect an account of what I said, and of my opinion on the matter referred to, that I shall be obliged by your insertion of this communication.

I agree fully with Mr. Hindmarch and Mr. Prosser as to the importance of having the complete and final specification filed at the time of the application for the patent, and I would afford every inducement for filing it then; but cases will occur in which time is required for ascertaining certain details which experience alone can supply: in such cases the provisional specification, coupled

with the protection afforded from the date of the application, by enabling any person to experiment in safety, and without prejudice to the after-acquired patent, appears to possess many advantages.

In illustration of this, I referred to the invention of Mr. Muntz, commonly called the yellow metal sheathing for ships. Mr. Muntz, after such experiments as he could carry on in secret, was led to believe that certain proportions of zinc and copper, of given quality, would possess the quality of rolling hot, and of oxydating sufficiently in sea water to keep the bottom of vessels clean, —the researches of Wollaston, Davy, and other philosophers, having suggested a sheathing which became foul for want of adequate corrosion.

Now provisional protection for six months, before the expense of the patent was incurred, would have been extremely serviceable in such a case, during which time the invention could have been tried without fear of prejudice to the patent; and there are many other cases of a similar nature.

To suggest that knowledge acquired during such publication might be used by a dishonest person to oppose the grant of a patent, is to try the new, by the defective practice of the old system; under the new system, the date of the application will be the dividing line, the time from which everything dates; the right was intended to be conferred on the first applicant, except in cases of fraud. To distrust the security of the provisional protection is to distrust the faithful administration of the new system by those to whom it is intrusted. The boon to the working man is, that for an official fee of 5*l.* he may obtain provisional protection for six months, during which time he may ascertain whether the invention has sufficient novelty and utility to warrant any further expenditure. To proceed at once with the patent will, in the majority of cases, be to throw away 25*l.* instead of 5*l.*, in addition to the extra professional charges of the subsequent stages, and of the final specification which, by a most excellent rule of the Commissioners, must be filed within six months from the date of the application.

To subject an inventor to opposition before obtaining provisional protection, is to perpetuate one of the crying defects of the old system, under which the acquisition of rights by the poor was placed at the mercy of the rich. Inventors may rest assured that the Commissioners will do their utmost to give the new system a fair trial; if further powers are wanting for that purpose, the voice of inventors will find a ready response in Parliament.

I am, Sir, yours, &c.,
THOMAS WEBSTER.

2, Pump-court, Temple, Nov., 1852.

LAKE'S SYSTEM OF CANAL STEAM NAVIGATION.

Yesterday we were present at a series of experiments performed on the Grand Junction Canal, near the town of Leighton Buzzard, Bedfordshire, the object of which was to exhibit, on the scale of actual practice, the efficiency, economy, and general advantages of the system of Steam Navigation proposed for Canals by Mr. John Lake, C.E., for which that gentleman obtained letters patent on the 8th of December last. The spot selected for the experiments is characterized by several local peculiarities which render it admirably suited to the display, in their full effect, of the great resources of this project; as there is probably not another in the entire length of the canal where greater engineering difficulties could be brought together, so as to assure the spectator that the experiments he witnesses are proceeding under the most rigorous circumstances that could present themselves. It is situated at the distance of about a mile and a half on the London side of Leighton, at a place called Grove. An extent of half a mile of the canal has here been placed at the disposal of Mr. Lake, by the Directors of the Company; and as the width is sufficiently great to admit of the old and the new systems being worked side by side, the strong contrast existing between the merits of the two is the better seen and appreciated. Within this short experimental piece we have, towards its northern extremity, an extremely sharp curve, and, about the middle, a rise, by a lock, of 7½ feet, approached by another curve, though of smaller radius. At this point there is a double lock, through one of which—that on the up side—the ordinary traffic of the canal still flows.

The gates of the other have been removed, and their functions superseded by an inclined plane, constructed on the principles laid down in Mr. Lake's specification. Beyond this the experimental line is continued for a considerable distance at the higher level, first in a straight, and then in a curved direction.

The substance of Mr. Lake's invention admits of being concisely stated, from its extreme simplicity, and we propose to give a succinct account of it in this place, that the results already accomplished by it may be fully appreciated. First, the permanent way of the works in every level section of the canal consists of a double line of light iron rails, supported at the uniform height of about 18 inches above the usual high-water mark, upon parallel walings, or beams of wood, to which they are attached by countersunk screws. The walings follow the course of the canal, and rest upon rows of piles driven into the bed of the canal, about 15 feet apart. Within the trackway thus formed a number of canal boats with square ends are brought together, and coupled rather closely, so as to constitute a train. Immediately in front of them is another boat, which contains the engine by which motion is to be communicated to the train. The piston-rods of the engine are directed upon cranks in a transverse shaft, which carry the driving-wheels, by the reaction of which upon the rails the whole train is set in motion. In order to produce the requisite tractive force, the driving-shaft is pressed downwards to the rails by a pair of levers, through which it passes freely, and which lie in the direction of the rails. The after ends of these levers are attached strongly to fixed points in the engine-boat, while their other ends are united by a transverse beam of iron, which can be raised or depressed by means of a powerful screw and lever. When the transverse beam is depressed, the driving-shaft and its wheels are pressed down upon the rails, and the engine being set in motion, the entire train of boats is drawn along. On level canals, or those without locks, the arrangements described are all that would be necessary in actual practice; but to raise the train from one level to another, an inclined plane of extreme simplicity and perfect efficiency has been proposed by the inventor, which at once does away with the loss of time, water, and enormous expenditure incidental to the present system of locking. This incline is, in fact, a double one. The walings ascend upon the heads of piles gradually increasing in height, and strongly framed together in both directions. As the engine would be utterly powerless to draw its train up even a moderately inclined surface, with a smooth rail, a strong rack-work is fixed upon it, which is continued beyond the summit of the incline for about the length of a train. The driving-shaft of the engine is provided with suitable pinions to gear into these racks; and the continuation of the latter will obviously enable the engine to draw the last boat of the train to the higher level. It is obvious that, by this arrangement, any amount of required fulcrum may be obtained. A line of large rollers or drums, mounted in plummer-blocks about 10 feet apart, which it is proposed to reduce to 5 feet, is fixed upon an inner and lower incline, and over these the bottoms of the boats pass, strips of stout iron being attached to them, to diminish the friction and to protect the bottoms, which are also strengthened otherwise. These rollers are continued under water in the upper and lower "pounds" of the canal, so that a support for the boats is provided the moment that the racks and pinions become engaged, and they are deprived of their natural support in the water.

The complete efficiency of this remarkably simple and ingenious mode of working a train of canal boats was amply demonstrated in the trials we witnessed at Grove, though neither in point of power, nor in precision of detail, is the mechanism at present to be regarded as a fair illustration of it. A small 10-horse engine, with its boiler and fuel, and subsidiary apparatus, was fitted in the leading boat, to which a train of twelve other boats was attached. These were merely old canal boats, with their sharp ends cut off square, to diminish the resistance in the water, and then cut into two smaller ones, which were laden with blocks of granite and bricks to the extent of about 100 tons. At first, the engine-boat was at the foot of the incline, and Mr. Lake ordered the train to be backed, or driven northwards along the level and smooth rails. A turn or two of the large

screw sufficed to produce a good bite between the driving-wheels and the rails; and the moment the engine was set in motion the train started, and proceeded with the greatest ease of motion through the water—no eddies resulting from it, nor any undulatory effects that would be detrimental to the banks. The train threaded its way, without difficulty, through the sharp curve at the northern end of the piece, the walings guiding it continuously and gently in its assigned course. In these curves, the only preliminary precaution to be observed is, to give a little divergency to the walings to the point of maximum curvature, and then to contract them gradually for the remainder of the curve, until their normal gauge is attained at the next straight piece. In going round a curve thus formed, a train of ordinary length will move freely, without risk of being jammed between the walings. In this trial, the readiness with which a train can be backed, even through a sharp curve, was clearly proved.

The engine was now reversed, and the train drawn forward in the usual manner. Its speed was here considerably above four miles per hour, and was then lessened, to show the control which the engine-driver had over it; and the levers were released until the wheels slipped upon the rails, and the train proceeded with the momentum it had acquired to the foot of the incline. There eight of the boats were detached; as the small engine at present in use is not of sufficient power to draw up more than a gross load of about 50 tons. The levers were again screwed down, and the engine set in motion, upon which the pinions geared into the racks, and the engine-boat rose gradually out of the water, commencing its ascent of the incline. As it continued to ascend, it rolled smoothly over the rollers below, and was followed by the four boats attached to it; all of which were landed, without the delay of a moment, in the upper pound of the canal. From this point the train proceeded along the remainder of its course in the upper level of the canal, and being brought back again to the incline, was allowed to descend it. The descent was accomplished with perfect ease, and the absence of all danger. All that the engineer had to do now, was to admit the steam into the cylinder on the other side of the piston, so as to render it effective in checking the motion, which would otherwise give to the mass a destructive momentum. Thus, the same engine which propels the train of boats along the level portions of the canal, by the arrangements here adopted, is also available for elevating from one level to another; a feat never before accomplished—or shown only in detail—except by means of stationary power.

The advantages of this arrangement over the present canal system scarcely require being pointed out. Any rational alteration in the extremely inartificial and unphilosophical application of power we now witness on our canals, cannot fail to be productive of advantage; but it is evident, too, that the train-system must be the basis of every approximation to economical working. Past experience, and, indeed, the remonstrances of common sense, declares against the adoption of paddle-wheels, or screw propellers, either in a train of canal boats, or in single ones; as the confined nature of the channel prevents the access of new water to the moving surfaces, and little better than a churning action is the result. We are therefore driven to substitute for the extremely imperfect reaction against canal water, that against fixed and rigid objects in the vicinity of the boats. This being so, it appears to us that Mr. Lake's system of canal steam-navigation embraces all the requirements of the case, and has combined in itself all the favourable circumstances that can be brought to its aid. Having given evidence of its efficiency, a few comparisons will prove its great economy.

First; as regards construction—premising here that existing canals can be altered without any stoppage of the navigation, and the locks and other works, if it should be deemed desirable, may be left freely open for the present clumsy method of hauling. A line of level railway can be laid down on this principle at a prime cost of 1,200*l.* to 1,500*l.* per mile, according as the wood employed is oak, fir, or beech. An inclined plane of average length would cost 1000*l.*, which would be an economical substitution for the expensive works of a lock. A flight of locks might be replaced by a sufficiently long incline;

and thus, upon the whole, places where locks must otherwise be constructed would become the cheapest portion of the entire work; as the inclines might be built upon land with but little excavation. The outlay incurred by laying down the works for an up and a down line of rails, would be far more than returned in a short time by the saving that would arise in the maintenance of the canal. Besides dispensing with the locks themselves, the heavy expense of lockage-water would be altogether removed; there would also be no charge for lock-keepers, no towing-paths to keep in repair, and all necessity for pumping water would at once disappear. But the greatest economy of all would arise in the cost of haulage. Every canal boat requires at least a staff of three men constantly present, and fresh for duty—one to drive the horse, another to steer the boat, and a third to run forward to get the locks ready. Of course, a larger number of persons, and four at the least must be on board, to enable certain of their number to rest when necessary. These men, besides the cost of a fresh horse at every twenty miles, must be kept in pay for each boat, which on an average conveys only 15 tons of cargo. Now under Mr. Lake's system, three men only would be necessary for a whole train of boats, as no steerers are necessary; and with a thirty-horse engine, which Mr. Lake proposes to use in practice, the train might be of almost indefinite length. The resistance of the water to a canal boat, moving at its usual speed, is about six times smaller than that of the resistance to a goods' train moving on a railway at a speed of twenty miles an hour—at which rate it is essential to carry goods on a railway, to keep the road clear for the passenger trains—and a 10-horse engine is sufficient to draw 1,000 tons on a level line of canal, at a speed of three miles an hour. As for the inclines, when once the engine has passed their summit with a train occupying the whole length of the incline, it matters little how many boats are on the level below, for they are then certain of being raised. Upon the whole, the greatest gross load which could be on the inclined plane at any one time could not exceed 120 tons, and the present engine of 10-horse power, takes over a gross load of 50 tons. Making the most liberal allowance for every detail of expenditure, the calculation gives from 7d. to 8d. per mile, as the cost of carrying 300 tons on Mr. Lake's system—an immense advantage as compared with the existing one, which is at least ten times greater, and even with railway transit.

Such are the merits of this admirable invention. It needs not much penetration to perceive that it incloses the germ of a new and gigantic system of internal conveyance of merchandise, by which a new impetus will be given to our home trade. By its adoption, the canal interest of this country may once more be restored to its former magnitude and importance, and raise its head from beneath the oppressive load of railway ascendancy. This much seems certain; indeed, that our goods' traffic can be more cheaply conducted in this way than by rail; and that, setting aside all considerations of rivalry, canal proprietors should have the enterprise to look forward to this invention as a means—and apparently the only means—of increasing their profits. They have been brought down entirely by mechanical means, and it is only by mechanical means, scientifically applied, that they can hope to be restored. We are glad to find that many of their number are perfectly satisfied with it on the score of efficiency, economy, and public convenience; and under all the circumstances, we eagerly expect the realisation of this great scheme, as promising for the public good, as in a mechanical point of view it is simple and beautiful.

TRIAL OF SIR THOMAS MITCHELL'S BOOMERANG PROPELLER.

The *Sydney Morning Herald* gives the following account of a trial trip of the steamer *Keera*, which had been fitted with Sir Thomas Mitchell's "Australian Boomerang Propeller:"—Gradually she acquired speed, says that journal, obeying her rudder from the first, so as to describe a fine curve on the water from her position off the patent slip into her direct course. As soon as the *Keera* got into her direct course, it was found that her speed surpassed any which she had hitherto attained on this coast. In her course along the first and best-authenticated distance—viz., 2,177 yards between Blue's Point and Pinchgut Island—the calculations were interrupted by a stop to receive on

board some additional visitors; but between Pinchgut and Bradley's Head (the flagstaff on the latter being the point of measurement) the distance, 2,099 yards, was performed in 6 min. 10 sec. We may here observe that, on the *Keera's* trial trip on the 10th of February last, she performed this distance in 8 min. 20 sec. Her strokes of the piston then were 42 per minute; on Saturday, between these points, they were 55. Greater speed, however, was soon afterwards attained; and a scientific gentleman, who has recently arrived from England, drew our attention to the appearance of the water near the propeller, which, instead of flowing in towards the stern, to be distributed there as in other screws, allowed the propeller to work through it very quietly. About this time the strokes of the piston were 62 per minute; and we must particularly direct attention to the fact that, with the English screw in, the engines of the *Keera* have very seldom indeed been got to work up to 50. This serves to prove the freedom of the Boomerang propeller from lateral resistance; while the greatest speed attained with a surface some 76 inches less than the English one, proves, we submit, beyond doubt, the efficiency of the Boomerang form, as an instrument of propulsion. We must further observe, that the pressure on the boiler never exceeded 10 lbs. to the inch,—and that Sir Thomas Mitchell's propeller combines the parabolic and cycloidal curves; equilibrium, gravitation; the laws of hydrostatics relating to the pressure on oblique surfaces under water; and more particularly, that particular law by which the area must be governed, and which the result of Saturday's trial fully establishes, namely, "that the area of working surface should never exceed the supplement of the spiral surface over the section taken at right angles to the shaft." Every inch more than this only retards the vessel, and prevents her from attaining gradually-increasing speed.

PROGRESS OF THE ELECTRIC TELEGRAPH.

The following article appears in the *Scientific American* of the 9th Oct., a publication devoting itself to subjects of science and invention, and recognized as an authority of some weight in the several States of the Union. It will be found to contain some comments on the projected Ocean Telegraph line, which we noticed in a recent Number, and we transfer it to our pages with a view of showing how this great idea has been received on the other side of the Atlantic:

No invention of modern times has extended its influence so rapidly as that of the Electric Telegraph. It is only eight years since the first electric telegraph line was erected in these United States; that was the one between Baltimore and Washington. At the present time, all the important cities in our country and Canada are united together by 25,000 miles of metallic electric nerves, which from day to day carry the news from east to west, and from north to south. If an important event transpires in any city of our Union this evening, an account of it is read by the people in the various cities next day. The spread of the telegraph is about as wonderful a thing as the noble invention itself; and its future influence upon all the nations of the earth must be very powerful. In Europe there are no less than 10,000 miles of electric lines; in Hindostan 3,000 miles of wire are soon to be erected, and in a few years more all the ends of the earth will be wooed into the electric telegraph circuit. The great success of the submarine telegraph between England and France has directed attention to a submarine line between Europe and America. The line across the English Channel to France contains four copper wires, covered with gutta percha, wrapped up in spun yarn and shielded with a helical wire tube, all forming one cable. It was laid down a year ago, has worked well, and paid a good dividend. The new proposed submarine line to connect the New World with the Old, is to commence at the most northwardly point of Scotland, run thence to the Orkney Islands, and thence, by short water lines, to the Shetland and the Ferroe Islands. From the latter the water line of 200 to 300 miles conducts the telegraph lines to Iceland; from the western coast of Iceland another submarine line conveys it to Kioge Bay, on the eastern coast of Greenland; it then crosses Greenland to Juliana's Hope, on the western coast of that continent, in latitude 60 deg. 42 min., and is conducted thence, by a water line of about 500 miles, across Davis's Straits to Byron's Bay, on the coast of Labradore. From this point the line is to be extended to Quebec. The entire length of the line is approximately estimated at 2,500 miles, and the submarine portions of it at 1,400 to 1,600 miles. The peculiar advantages of the line being divided into several submarine portions is, that if a fracture should at any time occur, the defective part could be very readily discovered, and repaired promptly and at a compartively trifling expense. From the Shetland Islands it is proposed to carry a branch to Bergen, in Norway, connecting it there with a line to Christiana, Stockholm, Gottenburg, and Copenhagen; from Stockholm a line may

easily cross the Gulf of Bothnia to St. Petersburgh. The whole expense of this great international work is estimated to cost about 2,500,000 dollars. The undertaking is one of great magnitude and will not be entered upon hastily, because the difficulties to be overcome to make it successful and to make it pay, are very great. We hope, however, to receive, before many years pass away, a message on the lightning's wing direct from Asia or Europe.

INSTITUTION OF CIVIL ENGINEERS.

The present Session of the Institution of Civil Engineers commenced on Tuesday evening at the house of the Institution, Great George-street, Westminster.

The chair was occupied by James Meadows Rendel, Esq., the President, and there was a large attendance of members.

The business of the Session was commenced by the announcement of the dates of the ordinary meetings; of the appointment of Dec. 21st for the Annual General Meeting for the election of the President, Council, and Officers; and of the 31st of May, 1853, for the President's *conversazione*.

The paper read was "On the Improvement of Tidal Navigations and Drainages;" by Mr. W. A. Brooks, M. Inst., C.E.

The object of the communication was chiefly to elicit observations from members, and the narration of facts which might be usefully employed hereafter, in an investigation into the laws which govern the flux and the reflux of the tide, in estuaries. The author, after alluding to the impediments to improvement, arising from the popular prejudice against such constructions as would appear, by their bulk, to diminish the space for the tidal water, proceeded to show with how little reason the hacknied phrases, "encroachment upon navigation," and "abstraction of tidal water," were applied indiscriminately to works which the experience of engineers pointed out as adapted to ameliorate the flow and ebb of tidal waters.

He then showed that estuaries were of two classes. The first and best kind were bounded by shores, gradually receding from each other as they approached the ocean, with their navigable channels bearing a large proportion to the full breadth of the stream at high water, as in the case of the Thames, &c.

The second, and inferior kind, had tortuous channels, of uncertain and various capacities, and with great disproportions between their relative widths at low and at high water.

The first class afforded perfect drainage to the country, on account of their capacious low-water channels, in which the declination of surface was very gentle; the transmission of the tidal wave was therefore quick, and it was able to turn early, and attain a head to overcome the ebb, so that the interval of stagnation, or rest at sea, was very short; which last was the best test for the general good state of a navigation. At the mouths of such rivers there were rarely any bars.

The features of the second class of estuaries were directly opposite to those of the first class; the body of water was generally divided into several tortuous streams at low water, their capacity being greatly disproportioned to the width of the bed, which offered an undue resistance to the flow and the ebb. There was great fall and consequent rapid loss of height in the tidal column, which caused a considerable interval of rest between the currents of the flood and the ebb, during which period a great amount of deposit took place. Numerous other features, and their results, were carefully pointed out and reasoned on.

The best means were then described for promoting the natural action of the tidal water in rivers of good condition, so as to combine the most efficient drainage of the country with the best state of the navigable channel. The Mississippi was then given as an instance of the effect of a large volume of water, densely charged with alluvial matter, falling into the nearly tideless Bay of Mexico—producing a delta of great extent, and so diminishing the depths of the harbours, as to prevent vessels of any considerable tonnage from frequenting the coast. This lead to the enunciation of the axiom, that in the improvement of rivers of the second class, although the river walls might not be raised above the level of half tide, they would suffice to determine the future condition of the bed of the estuary, behind and parallel with them, as the conversion of those reclaimed spaces into land was simply a question of time and of the amount of alluvial deposit brought down by the floods. Thus, by this system, the same effect would be eventually produced as by inclosing the space with full-tide walls, it being impossible to keep open the rear spaces as receptacles for tidal water.

The tendency to deposit, in consequence of the formation of breakwaters in certain situations, was fully considered, with the question of the difference between the relative times of high water, as affording a true test of the condition of a river: this latter view should be received with caution, as the only certain test, was the condition or progress of the tidal wave throughout the entire period of the flow. Thus the tidal

wave would pass more quickly through a broad and straight reach, after the sands were covered, although its progress might have been very slow in the early stage of the tide, in consequence of the opposition of the sandbanks, which would form for the nascent flow a restricted and tortuous course, through a reach which, at high water, might appear well-adapted for the ready transmission of the tidal column.

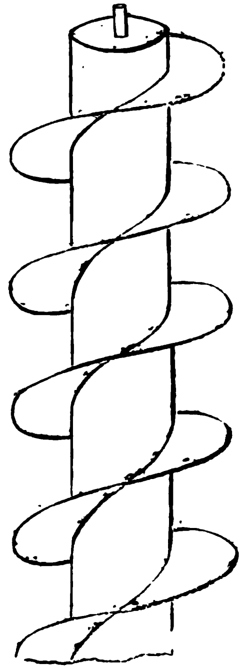
The author then described the broad principles of his own practice in training the current of a river; to be based chiefly on the construction of full tide timber groynes, or jetties, at right angles to the intended new line of river frontage. These structures, raised at a cost of from twelve to thirty shillings per running foot, had been aptly designated by Sir W. Cubitt "as the scaffolding for forming the new line of shore;" and as "making so much more land, and bringing the shore to the form represented by a line drawn through the ends of the groynes." In practice, it was found that whilst the spaces between these groynes afforded a locality for the deposit of the alluvial soil held in suspension, their action was also to produce a deepening of the main channel of the bed of the river, at a much less cost, than by the construction of parallel rubble walls. In fact, the latter should not be built until the groynes had completed their work, of raising the acquired land between them to the level of the bed on which the rubble walls were to be placed.

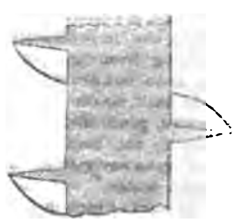
By adopting these means, there was scarcely a river whose navigable capacity might not be greatly increased, without any excessive outlay, aiding at the same time the general drainage of the district; which, it was remarked, had been lamentably neglected in many of the schemes promulgated for the improvement of rivers.

It was announced that, in consequence of the unavoidable absence of the author, the discussion on the paper would be renewed at the meeting of Tuesday, November 16th, when, if time permitted, the following paper would be read :—"Description of an Inclined Plane for conveying Boats over the summit level of a Canal, &c." By Mr. J. Leslie, M. Inst. C. E.

ALLAN'S SPIRAL ELECTRODES.

The great difficulty incidental to the management of the Electric Light—that of keeping up an equal and constant distance between the two charcoal points or electrodes—has been overcome by Mr. Thomas Allan, of Edinburgh; a gentleman to whom the electric telegraph system owes several valuable improvements. Mr. Allan has invented an ingenious form of Electrode, on a





spiral or screw principle, with an edge—as represented, in elevation and in section, in the accompanying figures. The two electrodes are placed perpendicularly to one another, at the proper distance, and in this relation made to rotate by a simple clockwork movement. The result is, that as the edge of the spiral instrument, or contact-point of the electrode, is in the course of being destroyed by the action of the current, and the distance between the two thereby increased, it is always regaining its proper position by the rotation of the electrodes

producing fresh points for action. In this manner a constant distance or relation is preserved, and hence a constant, steady light, the grand desideratum, the duration of which will depend only upon the length of the thread of the screw. For lighthouse purposes, in particular, this invention of Mr. Allan may prove highly beneficial, and we trust soon to see it fully tested.

HYATT'S ROTARY STEAM ENGINE.

An opportunity was recently afforded us of witnessing the operation of a steam engine on the rotary principle, the invention of Mr. Wm. Hyatt. In No. 1525 we described the construction of this engine as detailed in the specification, and explained that it consists chiefly of an elliptical cylinder of small eccentricity, having an axis passing through it a little below the lower focus of its transverse diameter, which is vertical. A piston, with a straight slot in the middle, slides freely upon the driving-shaft, which is cut square to receive motion from it; and the longitudinal ends of the piston are furnished with knuckle-joints, to make a steam-tight contact with the cylinder in every part of the revolution. The steam is admitted into one side of the cylinders, and drives the piston round with a force due to the excess of pressure on the longer arm of the piston.

The efficiency of the principle of this engine seems to be completely demonstrated by its working. Though the cylinder is only 2 feet long, and the diameters of its elliptical section 20½ and 18⅝, it ordinarily gives 30-horse power, and, working with a pressure of 82 lbs. on the inch, Rennie's dynanometer has indicated a power of 50-horse.

THE SUBMARINE TELEGRAPH.

SI;—We have hitherto abstained from noticing any of the statements which have appeared, from time to time, in the public journals, on the subject of Submarine Telegraphs, because they were evidently so exaggerated and distorted, as to carry along with them their own contradiction.

But as some of those misstatements, after a lapse of twelve months, are reappearing, we beg to lay before you a short account of our connection with submarine telegraphs.

As regards the Dover and Calais cable, we manufactured it in the short space of about three weeks, 24 miles in length and about 180 tons weight. We shipped it on board the *Blazer*, and there our responsibility ended. We had nothing whatever to do with the submerging of it, which was so managed that the 24 miles were found too short to cover the 21 miles of ground between Dover and Calais, and we afterwards made an additional mile, which was spliced on to the first length.

We beg to state that we were the sole manufacturers of this cable, having stopped, by injunction of the Court of Chancery, a Mr. Weatherley, an infringer of our patent, with whom Mr. Crampton, the engineer of the Submarine Telegraph Company, had previously contracted to supply it.

The Holyhead and Howth cable was made and laid down by us, on our own account. It worked perfectly for several days, after which its insulation became imperfect, from what cause we have not had time to find out, but intend trying to do so when the weather becomes favourable.

The Portpatrick and Donaghadee cable was also made by us, for the Magneto-Electric Telegraph Company.

We intended laying it down during the neap tides, in the end of September, and would then have had the valuable assistance of Lieut. G. M. Alldridge, of H.M.S. *Asp*, who had been sent to Portpatrick for that purpose, by the Lords of the Admiralty; but as the steamer with the cable was detained by gales in the Channel, we were obliged to defer the laying down till next neaps, and Lieut. Alldridge was recalled. We, however, had the kind advice of Capt. Hawes, R.N.

We made the attempt on Saturday, the 9th October, the weather appearing favourable. The point of departure was Mora Bay, about a mile north of Portpatrick, and the point of arrival was intended to be Donaghadee Harbour. We had greater difficulties to contend with than had been experienced on either of the former undertakings; the depth of the water varying from 10 to 150 fathoms (the greatest depth in the Dover Channel is 35 fathoms), the rapid currents off the Copeland Islands, and the unsettled state of the weather. We started at 8 A.M., after having got the end of the cable on shore, and had progressed successfully until about 3 30 P.M., when we had laid out about 15 miles of the cable, in nearly a straight line, between Portpatrick and Donaghadee. We were then about 7 miles from the Irish shore, and had got 9 miles of cable to lay out. The wind, which had previously been north, changed to west, and blew so strong that we could not keep the steamer's head towards Donaghadee, tied as she was by the stern. We were losing ground, a gale of wind and the tide against us, and the sea breaking over us, we therefore cut the

cable, and were glad to take shelter in Glenluce Bay all night. *Up to the moment of cutting the cable*, communications had been interchanged with those on shore by means of two sets of instruments, the magneto-electric and the double needle. Since then, the weather has been so boisterous as to render it impossible to complete the work.

In conclusion, we would just observe that R. S. Newall was the inventor of wire ropes containing a core of hemp, or other flexible material, and the application of this invention to electric telegraph rope is most obvious, for it is simply the substitution for the core of hemp of the core of gutta percha containing the electric wires, the manufacture of which is patented by the Gutta Percha Company, by whom the electric wires were made.—We are, Sir, yours, &c.,

R. S. NEWALL & Co.

Gateshead-on-Tyne, Nov. 10, 1852.

THE GREAT WESTERN RAILWAY TELEGRAPHS.

A number of men are now employed in laying down the wires of the Electric Telegraph Company along the line of the Bird-cage-walk, to be continued through Hyde-park up to the Great Western Railway station at Paddington, from whence the wires are now laid down to all the western parts of the United Kingdom, in communication with the Branch-office in the Strand, at the General Post-office, St. Martin's-le-Grand, and the Chief-office, Founders'-court, Lothbury, at the back of the Bank. The wires are of galvanized brass, with a thick coating of gutta percha, over which is a strong binding of tape saturated in tar, which will counteract any moisture or atmospheric influence; and to prevent injury or accidents to the wires, they are passed through iron tubes or pipes, the same as those recently laid down from the office in the Strand to the Chief-office in the city; but in this case, instead of there being only one line of wire, there are sixteen, which, together, present the appearance of an open rope, and each of which will have its respective line of correspondence to and from the chief ports, towns, and places of importance which the Great Western Railway and its branches touch at or pass near. This will establish a direct communication between the metropolis and the far-west of England and Wales. These wires, as well as those to nearly every other part of the United Kingdom, form a junction at the Board of Admiralty and the Treasury or Foreign-office, so that the Government can at all times have the facility of sending off their despatches, and *vice versâ* by the Electric Telegraph Company, in perfect secresy.

THE IRON TRADE.

The rumour of an advance in Iron has gained credence, and is now fully anticipated. When it does take place, it can scarcely fail to prove highly injurious to the general welfare of the hardware trades.

From the Board of Trade returns for the month ending on the 10th of October, which were issued on Tuesday, it appears that there is an excess in the declared value of the metals exported during that month amounting to 166,370*l.* over that of the corresponding month of the year 1851; the declared value of the exportations in the two years being respectively 964,182*l.* and 797,812*l.*

The current prices of iron in the American markets, up to the 30th ultimo, have reached us in the advices brought by the United States mail steamship, *Baltic*, which arrived at Liverpool on Wednesday.

No alteration had taken place since the last quotations. Sheet-iron and boiler-plates were scarce, and in demand, but operations were restricted for want of stock. Scotch pig brought from 29 to 31 dollars cash, and from 30 dollars 50 cents to 32 dollars 50 cents, six months. 20,000 tons of railroad iron had been contracted for, at 55 dollars, cash on delivery.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING NOVEMBER 11, 1852.

ALFRED TYLOR, of Warwick-lane, and HENRY GEORGE FRASI, of Herbert-street, North-road. *For improvements in heating and supplying water for baths and other uses, in the construction of water-closets, and in supplying them with water, and in cocks for drawing off liquids.* Patent dated April 27, 1852.

1. The patentees interpose between the source of water supply and the bath requiring the heated water, an arrangement of boiler heated by gas through which the water is caused to pass slowly, so that it may during its passage receive a sufficient accession of heat.

2. They construct water-closets wherein the supply of water is regulated by the raising of the handle acting directly on a float placed in a contiguous cistern of water. An arrangement is also described for ship use where the water is supplied and the soil drawn off and discharged by a pump.

3. The patentees construct locks or taps, so that the valve may be raised from its seat without turning with the spindle. The valve is formed with an internal screw-thread, and

is raised by a screw on the spindle taking into this thread. They also describe a ball-cock, in which the valve is hinged at the upper edge and moved away from its seat by a lever operated by the ball.

Claims.—1. The improvements in combining apparatus for heating and supplying water to baths and other vessels.

2. The mode of combining apparatus in constructing water-closets and providing means for supplying them with water.

3. The improvements in cocks.

THOMAS RICHARDSON, of Newcastle-upon-Tyne. *For improvements in treating matters containing lead, tin, antimony, zinc or silver, and in obtaining such metals or products therefrom.* Patent dated April 28, 1852.

The *first* part of the invention has for its object the separation of certain metallic oxides from each other. The patentee operates on the mixed oxides of lead and antimony, or lead and tin obtained during the process of softening the hard lead of commerce, and also on the mixed oxides of tin and copper produced by calcining the waste alloys of these metals in a reverberatory furnace under the action of hot air. The first class are treated with nitric or acetic acid, by which the lead will be obtained as a nitrate or acetate, and the tin or antimony left for subsequent conversion by any known process to a marketable state. The second class are also acted on with acetic or sulphuric acid to obtain the copper as an acetate or sulphate which may be separated by washing, leaving the tin to be converted to the metallic state, or used in manufacturing muriate of tin, or stannate of soda, according to the manner practised by producers of these salts.

The *second* improvement consists in reducing the mixed oxides of lead and antimony by calcining them when mixed with alkali and carbon (coal) in the proportion of 20 cwt. of mixed oxides, 1 cwt. of coal, and ½ cwt. of alkali, in a suitable furnace. If the proportion of antimony in the mixture exceeds 20 to 30 per cent. a further quantity of alkali must be added in the ratio above named. The calcination of the mass is continued, after lixiviation and drying, until the lead is converted into red oxide, which may be washed and dried and used as a paint, or instead of litharge in the manufacture of glass.

The *third* part of the invention consists of a mode of treating sulphuret ores of lead. These the patentee calcines in a reverberatory furnace under a gradually-increasing heat, until all the sulphur is expelled, when the usual smelting process is performed.

The *fourth* improvement consists in calcining the residue of the distillation of zinc ores, according to the Belgian or Silesian processes, when mixed with matters containing lead and silver, such as the mixed oxides of lead and antimony, or lead ores roasted as above described, or gray slag, alone or mixed with a certain proportion of galena. This operation is performed in a blast furnace with the injection of a fine spray of water, and the residual products are collected and treated in the manner usually adopted.

WILLIAM NEWTON, of Chancery-lane, civil engineer. *For improvements in machinery for weaving, colouring, and marking fabrics.* (A communication.) Patent dated April 28, 1852.

The "improvements in weaving" comprise; 1. A method of employing two or more shuttles in the loom, so that in the event of the shoot of weft failing or breaking, or of the shuttle flying out or becoming exhausted, another may be ready to take its place, and may be set to work without stopping the loom. 2. A method of giving to the batten an intermittent speed, so that it may be enabled to "dwell" at certain intervals while the wires for forming pile are being introduced. 3. A method of introducing the pile wires by means of tubes, which are passed across from the opposite side of the warp to that at which the wires enter, and receive the wires and deposit them in their proper positions. And, 4. A peculiar construction of self-acting temple, having teeth or points which are alternately protruded and drawn back, and by means of which, with the aid of the weft threads looping around the same, selvages are produced to the fabric.

The "improvements in colouring and marking fabrics" consist in the use for that purpose of stencil plates having any required pattern perforated therein, and either flat or curved in combination with colour rollers composed of a flexible material for depositing the colours on the fabrics through the perforations in the plates.

CHARLES FISHER, of South Hackney. *For improvements in transferring ornamental designs on to woven and textile fabrics, and in the apparatus connected therewith.* Patent dated April 29, 1852.

Mr. Fisher proposes to ornament woven and textile fabrics by transferring on to their surfaces ornamental patterns cut out of thin leaf metal and caused to adhere by pressure, the woven fabric having been previously prepared with glaire, or other suitable adhesive composition, or with an extra quantity of dressing.

Claims.—1. The transferring or impressing designs on to woven and textile fabrics in the manner described.

2. An arrangement of pressing machinery and of machinery for receiving the fabric after having had the design transferred thereto.

JAMES FLETCHER, of Leyland, Lancaster, bleacher. *For improvements in machinery or apparatus for stretching and drying woven fabrics.* Patent dated April 29, 1852.

This machinery consists of a drum or cylinder heated internally by steam, and having around it a couple of shifting hoops, the edges of which are furnished with projecting pin points, by which the fabric to be stretched and dried is held. The hoops are also jointed, to admit of their being adjusted to fabrics of different widths, and are worked in connection with other guide hoops or rings and slides, by which they are caused to exert a suitable stretching action on the fabrics.

Claim.—The arrangement of the rings, pins, and slides on the drum or cylinder.

PETER BRUFF, of Ipswich, civil engineer. *For improvements in the construction of the permanent way of rail, tram or other roads, and in the rolling stock or apparatus used therefor.* Patent dated April 29, 1252.

The patentee describes and claims—

1. A clip or fishing key for supporting and keeping securely in place the ends of rails; a mode of placing longitudinal sleepers and chairs; and a mode of fastening the ends of rails on railways.

2. A peculiar combination of parts forming plank roads in connection, or otherwise with ordinary roads. (This mode of construction consists in forming roads to support rails, or for ordinary traffic, by laying diagonal planks in two or more thicknesses on longitudinal bearers, and then covering or not with gravel and other road-making materials.)

3. The forming of the tyres of railway wheels (with broad flanges) to admit of the vehicles they support being moved on flat surfaces.

JOHN LINTORN ARABIN SIMMONS, of Oxford-terrace, Hyde-park, Captain in the Royal Engineers, and THOMAS WALKER, Esq., of the Brunswick iron-works, Wednesbury. *For improvements in the manufacture of ordnance, and in the construction and manufacture of carriages and traversing apparatus for manœuvring the same.* Patent dated April 29, 1852.

1. The "improvements in the manufacture of ordnance" consist in forming the same by boring out a solid piece of metal which has been produced by piling layers of segmental bars of iron laid spirally around a central core. The segmental bars should be of hard steely metal, and the central core of a softer iron, in order that the boring process may be less troublesome. The trunnions are formed in a separate piece from the body of the gun, and shrunk on afterwards, and the sights are fitted on subsequently.

2. The improved "carriages" are made of wrought iron, and consist of two side pieces, of a triangular form, securely tied to each other by cross bars. The trucks for the carriage to run on are attached to the front and rear ends of the triangular side frames, at the apices of which are placed the trunnion boxes, in which the gun is supported.

3. The "traversing apparatus" consists of a long carriage, on which the gun-carriage is supported. The upper surface of the traversing carriage is inclined upwards, from front to rear, and the gun in recoiling has consequently to run up an inclined plane. The traversing carriage turns horizontally in the arc of a circle around a pin at the forward end, and has trucks or rollers to enable it to be easily moved.

Claims.—1. The manufacture of ordnance from a series of segmental bars of wrought iron, fagotted and arranged about a core or cylinder.

2. The gun-carriages, and the traversing and manœuvring apparatus constructed and arranged as described.

JOHN CUMMING, of Paisley, Renfrew, pattern designer. *For improvements in the production of surfaces for printing or ornamenting fabrics.* Patent dated April 29, 1852.

This invention consists mainly in the application of the electro-metallurgical process for the production of figured surfaces for printing blocks and rollers. In certain cases wire gauze is used, in order to enable the figures to be obtained in bolder relief. The claims include the several modes of operating described in carrying out the invention.

STEWART MCGLASHEN, of Edinburgh, artist. *For the application of certain mechanical power for lifting, removing, and preserving trees, houses, and other bodies.* Patent dated April 29, 1852.

1. For lifting and removing trees a set of cutters are inserted into the earth around the tree, and their upper parts forced outwards, so as to compress the earth around the roots of the tree into a ball. A carriage frame is then built about the tree, and pressure applied to it and the cutters, so as to raise the whole from the ground, when the carriage may be moved to the spot where it is desired the tree shall be replanted. This method may be adopted for the removal of all kinds of trees and

shrubs, and in some cases a trench is dug to facilitate the operation of lifting.

2. In the case of houses, beams of timber are passed through under each of the floors, and the end of the beams united by an exterior framing, by which the perpendicularity of the walls is preserved. The ends of the lower beams are supported on wheels, which run on rails laid to the place to which the house is to be transported; and any convenient means may be adopted for moving the house to this position over a new foundation, where the beams and framing are then removed, and the house left standing.

GEORGE GOODMAN, jun., of Birmingham, manufacturer. *For an improved method or improved methods of ornamenting japanned metal and papier maché wares.* Patent dated April 29, 1852.

The improved mode of ornamenting japanned metal and papier maché wares, which constitutes the subject of this patent, consists in transferring, by the ordinary means, impressions printed on paper in oil colours from engraved copper-plates, of which a separate plate is used for printing each separate colour in the pattern. The transferred impression on the ware is finally varnished in the manner commonly adopted.

Claim as above.

JOHN HINKS, of Birmingham, manufacturer, and EUGENE NICOLLE, of Birmingham, civil engineer. *For a new or improved composition, or new or improved compositions and machinery for pressing and mouldi: g the same, which machinery is also applicable for moulding or pressing other substances.* Patent dated April 29, 1852.

1. The new compositions are formed of gutta percha, mixed with farinaceous materials, such as wheat or barley flour starch, or potato flour, in the proportion of three parts of gutta percha to one of flour, and with or without the further admixture of woody fibre, such as hemp, &c. The woody fibre may be also used without the farinaceous materials. The mixture of the several matters is effected by means of heated rollers, revolving at different velocities.

2. The compositions having been rolled into thin sheets, are stamped up in an excentric press into the form of boxes, for holding steel pens and other small articles. The same arrangement of machinery may be also used for pressing other plastic materials into moulds.

Claims.—1. The composition or compositions of gutta percha and farinaceous matters, and of gutta percha and woody fibre, or of gutta percha with both woody fibre and farinaceous matters.

2. The method of constructing a machine for pressing or moulding the improved composition or compositions into boxes for packing or containing steel pens and other small articles, and the application of the said machine to pressing plastic substances generally.

JOHN ROBINSON, of Rochdale, wood-merchant. *For improvements in machinery or apparatus for shaping wood into mouldings and other forms.* Patent dated April 29, 1852.

The *first* improvement consists in attaching the cutter of shaping and moulding machines to their blocks or holders by means of bolts having dovetailed heads fitting into similarly-formed grooves in the holders, which arrangement enables the cutters to be shifted transversely to any desired position.

The *second* improvement consists in fitting the cutter-spindles into conical bearings (the ends of the spindles being formed conical for that purpose), to enable the bearings to be adjusted so as to compensate for wear.

The *third* improvement consists in mounting the table of such machines on a swinging centre, so that its position with respect to the edge of the cutting tools may be varied to any desired angle of inclination.

Claims.—1. The method of attaching the cutters to their blocks or holders.

2. The use of conical centres as bearings for the cutter-blocks and spindles.

3. The employment of apparatus suitably constructed and arranged for causing the surface on which the moulding is to be formed, and the axle on which the cutters revolve, to assume different angles to each other at pleasure.

CHARLES THOMAS, of Bristol, soap-manufacturer. *For improvements in the manufacture of soap.* Patent dated May 1, 1852.

1. Mr. Thomas employs an arrangement of apparatus for stirring soap in the boiling pans, in order to facilitate the escape of steam, and prevent the materials boiling over.

2. He performs the operation of pressing soap in the frames by means of fluid pressure derived from a liquid (such as alkaline solution) of greater specific gravity than soap, which is forced into the lower part of the frames as the soap shrinks in bulk by cooling. The temperature of the solution should range between 160° and 200° Fahr., in order that the soap may not be unduly cooled by contact with it.

Claims.—1. The combination of apparatus for stirring soap.

2. The pressing of soap in the frames by means of fluid pressure.

HUGH LEE PATTINSON, of Scot's House, near Newcastle-on-Tyne, manufacturing chemist. *For improvements in smelting certain substances containing lead.* Patent dated May 1, 1852.

The residuum left when manufacturing oxichloride of lead from galena, by the use of hydrochloric acid, according to Mr. Pattinson's patented process, is found to contain still a portion of lead mixed with earthy matter, and all the silver originally existing in the lead ore. Some of the lead might be utilized by further treatment with acid, but a residuum would still be left, and also the silver, and the smelting of this residuum according to the ordinary process, would not perfectly effect the separation of the lead and silver.

This object Mr. Pattinson proposes to accomplish by smelting the residuum or residua obtained as aforesaid, with common salt and granulated iron, in a reverberatory furnace. The proportions used are 4 parts residuum, 1 part common salt, and 1 part granulated iron, or iron borings or filings. The materials, when melted, are run into a conical mould, and when cold the lead and silver, which will settle to the bottom, may be broken off, and the slag remelted on a common slag hearth.

Claim.—The smelting of the residuum or residua, arising in the manufacture of Pattinson's oxichloride of lead, by fusing the same with common salt and disintegrated or granulated iron.

HENRY BRIDSON, of Bolton, Lancaster, bleacher. *For improvements in machinery for stretching, drying, and finishing woven fabrics.* Patent dated May 1, 1852.

Mr. Bridson describes and claims—a peculiar arrangement of machinery, employed in connection with vibrating stenter-frames, by which an equal and simultaneous rotary motion, as well as a vibratory motion, is imparted to the driving pulleys—the vibratory motion of the frame-sides and pulleys acting independently of or in combination with the rotary motion.

EDWARD GEE, of Liverpool, merchant. *For improvements in apparatus for roasting coffee and cocoa.* Patent dated May 1, 1852.

Mr. Gee's apparatus consists of a vertical cylinder, divided horizontally into two compartments; the lower one encloses a fire-place or furnace, and the upper one contains a tray of wire gauze or perforated metal, which receives the coffee or cocoa to be roasted. A vertical shaft is fitted into the upper or roasting part of the cylinder, and is provided with two horizontal blades, and set in rotation during the process in order to keep the coffee or cocoa from being burned; and by opening a door in that part, the materials, when roasted, are thrown off the tray by the same means.

Claim.—The improved combination of apparatus for roasting coffee and cocoa.

THOMAS MOSDELL SMITH, of Hammersmith, gentleman. *For improvements in the manufacture of wax candles.* Patent dated May 1, 1852.

These improvements consist in adopting the use of plaited wicks in the manufacture of wax candles. The wicks are first saturated with a solution of 4 oz. borax, 1 oz. chlorate of potash, 1 oz. nitrate of potash, and 1 oz. salammoniac, dissolved in 3 quarts of water; after which they are drained, dried, waxed, strung, and dipped, and the manufacture of the candles is concluded by moulding and rolling as commonly practised. Mr. Smith states, that under the designation of "wax" candles he would also include those composed of mixtures of wax and spermaceti, a certain proportion of the latter material being generally used in wax candles.

Claim.—The manufacture of wax candles as described.

JAMES JOHNSON, of Waterloo-place, Kingsland, hat manufacturer. *For certain improvements in the manufacture of hats.* Patent dated May 1, 1852.

Claims.—1. The introduction of whalebone into tarletan and other like fabrics, for the purpose of making hat bodies therewith.

2. The combination of whalebone with leaves of cork, or with cork dust, for the purpose of making hat bodies, or parts of hat bodies.

3. The making of hat bodies, or parts of hat bodies of such woven fabrics as are now usually employed, but combined with cork dust or powder (mixed with the water lac.)

The Duke of Wellington War Steamer.—The *Cyclops* steam-frigate arrived at Portsmouth on Tuesday, from Greenock, with the *Blazer* old steamer-hulk in tow, containing the first instalment of the machinery for the *Duke of Wellington*, 140.

Lord John Russell and the Leeds Mechanics' Institution.—Lord John Russell has, we are gratified to learn, acceded to the invitation of the Committee of the Leeds Mechanics' Institution and Literary Society to preside at the next *soirée*. His Lordship has, we believe, named Thursday, December 2nd, as the day on which it would be convenient to him to visit Leeds on this highly interesting occasion. The honour of a visit from an ex-premier to a mechanics' institution is nearly unparalleled, and is a gratifying sign of the times.—*Leeds Mercury.*

The Stornoway.—The bottom of this

vessel is now exposed to view in Mr. Green's dry dock, and presents a most extraordinary appearance. The copper is stripped off to the extent of nearly one-third, and she is encrusted with barnacles of unusual size from stem to stern. It is certainly remarkable that, under such disadvantageous circumstances, the *Stornoway* should have beaten that fine American vessel, the *Surprise*; and, after all that has been said of the superior sailing qualities of American-built vessels, we may now derive a little encouragement.

The New Steam-ship Arabia.—The Royal Mail steamer *Arabia*, built for the Cunard line, is now getting her boilers on board. They are of tubular construction, the tubes running athwart ships, with the furnaces of the two boilers facing each other. The boilers are shipped in sections, and riveted together in the hold of the ship. They are the largest boilers ever constructed, and are intended to supply steam to the largest engine ever built.—*Scientific American.*

State Encouragement of Science.—We feel a sincere pleasure in directing attention to the following paragraph in the speech from the throne:—

"The advancement of the fine arts, and of practical science, will be readily recognized by you as worthy of the attention of a great and enlightened nation. I have directed that a comprehensive scheme shall be laid before you, having in view the promotion of these objects, towards which I invite your aid and co-operation."

This is, indeed, a most gratifying indication of enlightened liberality on the part of our Government, which we trust soon to see largely realized. In any scheme of the kind, we hope that an annual grant for the Craig Telescope will find a place.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 5, 1852.

219. Arthur Richard Burr. Certain improvements in making gun and pistol barrels, applicable to the manufacture of other kinds of tubes.

Dated October 15, 1852.

394. Robert Hawkins Nicholls. An invention for horse-hoeing land.

Dated October 20, 1852.

450. George Heyes. Improvements in the manufacture of fancy woven or textile fabrics, and in the machinery or apparatus connected therewith.

451. Robert Brown. Certain improvements in the method of ventilating buildings or apartments, and in the apparatus connected therewith.

452. John Carnaby. Apparatus for turning, managing, and regulating the main taps of gas pipes laid on to houses or buildings, at a part of the house or building distant from the main tap.

454. Charles Clarke, and John Gilbert. Improvements in the supply and distribution of water and other fluids.

455. Auguste Edouard Loradoux Bellford. Improvements in cocks or taps.

456. Anthony Liddell. Improvements in stuffing-boxes and pistons.

457. Auguste Edouard Loradoux Bellford. A new mechanism to reverse the motion of steam engines, particularly of locomotives.

458. Peter Evans Donaldson. Improvements in dams, locks, and lock-gates.

459. Charles Weightman Harrison, and Joseph Harrison. Improvements in protecting insulated telegraphic wires.

460. Gustave Paul de Lhaynes. Improvements in apparatus for public announcements or advertisements.

461. Thomas Henry Biddles, and John William Duphrate. Improvements in machinery for the manufacture of textile and looped fabrics.

462. Jacob Tilton Slade. An improved hoisting apparatus.

463. William Harrison. Certain improvements in machinery or apparatus for sizeing, and otherwise preparing cotton, wool, flax, and other warps for weaving.

464. John Gilbert, and Samuel Nye. Improvements in mincing meat and other substances.

465. Joseph Cundy. Improvements in hot-air stoves.

466. Robert Burns, and Richard Pritchard Willett. Certain improvements in machinery or apparatus for cutting bones.

Dated October 21, 1852.

468. Alexander Thomas. Certain improvements in the treatment and welding of metals by certain chemical combinations.

469. Robert Hoppen. Improvements in apparatus for mincing meat.

470. William Lukyn, the elder. A liquid draught detector, or self-measuring tube, with a union conveyance tap and its stock and time-table.

472. Joseph Rose. Improvements in locks.

473. Julian Bernard. Improvements in the production of ornamental surfaces upon leather.

475. John Currie. Improvements in grinding wheat and other substances, and in the treatment and preparation of such substances, and the products thereof.

476. Samuel Marsh. Improvements in the manufacture of woven fabrics by means of lace machinery.

477. Henry Charles Gover. Improvements in the apparatus used in printing with colours.

478. Robert Chalker. Improvements in the manufacture of manure.

479. William Addison. Improvements in constructing and propelling vessels.

480. John Fowler. Improvements in machinery for draining land.

481. John Fowler. Improvements in laying wires for electric telegraphs.

482. John Fowler. Improvements in reaping machinery.

483. John Fowler. Improvements in machinery for sowing seed and depositing manure.

Dated October 22, 1852.

484. George Ellins. An improved method and apparatus for dressing and cleaning flax straw.

485. Jean Marie Souchon. Improvements in the manufacture and purification of gas for illumination, and certain products therefrom, and in apparatus for that purpose.

486. Julien Boilesve. An improved mode of

preserving vegetable substances and animal coatings.

487. Archibald Slate. Certain improvements in the manufacture and construction of cores, and core-bars, used in the production of hollow castings in iron and other metals.

488. Juliana Martin. An improved apparatus for artificial hatching.

489. Peter Armand Le Comte de Fontaine Moreau. Improvements in apparatus for essaying silk, cotton, and other similar fibrous substances.

490. Stanislaus Hoga. Improvements in separating gold from the ore.

491. James Wilson. Improvements in printing fabrics of silk or partly of silk.

Dated October 23, 1852.

492. John Holmes. Improvements in lathes.

493. George Price. A new or improved gas stove.

494. Philip Berry. Certain improvements in machinery or apparatus for manufacturing bolts and nuts, and other similar articles in metal.

495. David Crichton. Arrangements and apparatus for producing continuous circular motion, giving a series of different velocities obtained from alternate motions, applicable to looms and other machines.

496. Thomas Fothergill, and Alexander Cumming Harvey. Certain improvements in the treatment of cotton wool, and in the manufacture of coloured yarns or threads therefrom.

497. Louis Napoleon Legras, and William Lawrence Gilpin. Improvements in the generation of electricity.

500. Arnold James Cooley. Improvements in the manufacture of artificial leather.

501. Louis Napoleon Legras, and William Lawrence Gilpin. Improvements in treating flax, hemp, and other fibrous substances.

502. Charles William Graham. Improvements in the manufacture of bottles and jars.

503. Albert Hiscock. The application of ornamental printing to certain fabrics, which have hitherto not been printed upon.

504. George Kennedy Geyelin. An improved machine for grinding pigments or other vegetable or mineral substances.

505. William Macbay. Improvements in extinguishing fire in dwellings, factories and other buildings, and in ships.

506. Robert Mudge Marchant. Improvements in the construction of bridges.

507. Felix Lieven Bauwens. Improvements in treating fatty matters prior to their being manufactured into candles and mortars, which are also applicable to oils.

508. William White. An improved fabric, suitable for ventilating hat bodies.

509. Charles Watson. Improvements in ventilation.

Dated October 25, 1852.

512. John James Stoll. Improvements in the manufacture of boots and shoes and similar articles, and in machinery used therein, entitled Metallic Toothed, and Wedged Seams, and Water-Proof Elastic Indented Stitches.

514. Charles Leon Desbordes. Improvements in instruments for measuring the pressure and temperature of air, steam, and other fluids.

515. Robert William Mitcheson. Improvements in anchors.

516. Arthur Wall. Improvements in the manufacture of sulphuric and other acids.

517. Joseph Florentin Anacharsis Debray. An improved stock or neckcloth.

518. William Johnson. Improvements in the manufacture of spikes or metal pins.

Dated October 26, 1852.

520. Claude Mamés Augustin Marion. A new kind of damper for moistening stamps and paper.

521. John Cass. Improvements in steam engines.

522. William Smith and John Smith. Certain improvements in garments and articles of dress.

523. William Clarke. Improvements in joints or connecting metals.

524. Charles Rowley. Certain improvements in nails.

525. Myer Myers, and Maurice Myers. Certain improvements in pens and penholders.

526. James Nasmyth. An improved mode of utilizing running waters.

527. Joseph Charles Frederick Baron de Kleinsorgen. An improved apparatus for indicating the variation of the magnetic needle.

529. Robert William Mitcheson. An improved safety hook.

530. Henry Page. Improvements in paper staining.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," Nov.* 2 1852.)

337. Henry McFarlane. Improvements in stoves or fire-places.

338. Robert Lambert. Improvements in tents.

355. Peter Warren. An improved material, applicable to many purposes for which papier maché and gutta percha have been or may be used.

364. Matthew Smith. Improvements in machinery for weaving and printing.

367. Peter Armand Lecomte de Fontaine Moreau. A certain chemical combination for the silicatisation of calcareous matters.

369. Thomas Suttie. Improvements in roasting apparatus.

374. Christopher Hill. Improvements in the manufacture of lubricating matters.

375. Gerard Andrew Arney. Improvements in coating or enamelling pictures, prints, paper, and other surfaces.

376. Henry McFarlane. Improvements in constructing metal beams or girders.

377. Martyn John Roberts. Improvements in galvanic batteries, and in obtaining chemical products therefrom.

380. Alfred Augustus De Reginald Hely. An improved waiter or tray.

387. Joseph Major. An invention for removing spavins, ringbones, curbs, splents, and other unnatural ossifications and humours from horses, which invention he names Major's Celebrated British Remedy.

389. James Webster. Improvements in the construction of springs.

390. John Swindells, and William Nicholson. Improvements in obtaining oxygen gas, and applying it in the manufacture of various acids and chlorine, for oxydating metallic solutions, and for ageing and raising various colouring matters.

398. Hermann Turck. Improvements in propelling vessels.

401. William Edward Newton. Improvements in washing and amalgamating gold and other metals.

407. Charles Henry Waring. Improvements in the cutting and working or quarrying of coal, stone, shale, clay, and other similar substances, and in machinery for that purpose.

423. John Oliver York. Improvements in connecting and in fixing rails in railway chairs.

428. John Campbell. Improvements in the treatment or finishing of textile fabrics and materials.

432. Edwin Heywood. Improvements in looms.

440. Fennell Herbert Allman. Certain improvements in the manufacture and construction of brushes.

446. Robert Bird. Improvements in the straining webs of saddles.

448. James Otams. Improvements in the manufacture of manure.
476. Samuel Marsh. Improvements in the manufacture of woven fabrics by means of lace machinery.
478. Robert Chalker. Improvements in the manufacture of manure.
480. John Fowler. Improvements in machinery for draining land.
482. John Fowler. Improvements in reaping machinery.

(From the "London Gazette," Nov. 9, 1852.)

35. Thomas Huckvale. Improvements in instruments for administering medicine to horses and other animals.
45. Charles William Rowley Rickards. Improvements in tongs for screwing pipes and tubes.
113. Bernhard Harczyk. An improved preparation or composition of colouring matter to be used in washing or bleaching linen and other washable fabrics, and in the manufacture of paper and other substances.
153. David Stephens Brown. An agricultural implement for tilling the soil.
154. David Stephens Brown. An invention for obtaining useful products from sewers.
155. David Stephens Brown. An improved means of navigating the water by ships.
160. Joseph Burch. Certain improvements in building and propelling ships and vessels.
179. Frederick Newton. Improvements in the apparatus to be employed for producing photographic pictures.
192. George John Philps. Improvements in hats and other like coverings for the head.
193. Ralph Errington Ridley. Improvements in cutting and reaping machines.
230. David Stephens Brown. An improved apparatus or instrument for evaporating or distilling liquids.
235. Adam and John Booth. Improvements in platting or braiding machines, which machines are applicable to manufacturing webs for making door and other mats.
237. Herm Jäger. Improvements in the treatment of cotton and other similar fabrics, by the introduction of chemical agents to supersede the use of dung in the dunging process.
288. Augustus Waller. Improvements in the means of measuring or ascertaining the quantity of alcohol and other substances in brandy, wine, beer, and other liquids.
290. William Horsfield. Improvements in splitting, crushing, and grinding corn, seeds, grain, minerals, or other substances.
297. Alfred Kent. Improvements in glazing.
336. Charles Matthew Barker. Improvements in sawing wood.
370. Robert Pinkney. Improvements in cases for holding marking materials.
382. William Chisholm. Improvements in the purification of gas, and the obtention of certain products during the process of such purification.
392. Joseph Burch. Certain improvements in baths and bathing.
393. Joseph Burch. Certain improvements in building ships and vessels, for the purpose of saving lives and property in cases of shipwreck or fire at sea.
399. Joseph Hopkinson. Improvements in steam boilers.
400. Simon Pincoffs, and Henry Edward Schunck. Improvements in the treatment of madder and other plants of the same species, and of their products, for the purpose of obtaining dyeing materials.
409. Evan Leigh. Certain improvements in machinery or apparatus for carding cotton and other fibrous materials.
413. Charles Tiot Judkins. Improvements in machinery or apparatus for sewing or stitching.
415. William Beckett Johnson. Improvements in stationary steam engines.
423. Samuel Fletcher Cottam. Improvements in quarrying slate.
425. William Roberts. Improvements in machinery for stopping and lowering cables and other chains.
428. George William Lenox, and William Roberts. Improvements in machinery for raising and lowering cables and other chains.
450. George Heyes. Improvements in the manufacture of fancy woven or textile fabrics, and in he machinery or apparatus connected therewith.
469. Robert Hoppen. Improvements in apparatus for mincing meat.
475. John Currie. Improvements in grinding wheat and other substances, and in the treatment and preparation or such substances, and the products thereof.
476. Samuel Marsh. Improvements in the manufacture of woven fabrics by means of lace machinery.
478. Robert Chalker. Improvements in the manufacture of manure.
480. John Fowler. Improvements in machinery for draining land.
481. John Fowler. Improvements in laying wires for electric telegraphs.
482. John Fowler. Improvements in reaping machinery.
483. John Fowler. Improvements in machinery for sowing seed and depositing manure.
490. Stanislaus Hoga. Improvements in separating gold from the ore.
491. James Wilson. Improvements in printing fabrics of silk or partly of silk.
492. John Holmes. Improvements in lathes.
502. Charles William Graham. Improvements in the manufacture of bottles and jars.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION DEPOSITED.

Thomas Potts. Improvements in the manufacture of hinges, and in machinery for producing the same. October 27.

NOTICE TO CORRESPONDENTS.

In our notice of the new line of electric telegraph to the Continent, in our last Number, we inadvertently omitted to state that the wires were insulated by the Gutta Percha Company. We purpose, therefore, reverting to this subject in our next week's Number, when we shall give a woodcut exhibiting its structure.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Louis Arnier, of Rue du Loisir, Marseille, France, engineer, for certain improvements in steam boilers. November 6; six months.

Pierre Armand Lecomte de Fontainemoreau, of South-street, Finsbury, English and foreign patent agent, for certain improvements in the manufacture of certain articles of dress. (Being a communication.) November 6; six months.

Charles Liddell, of Abingdon-street, Westminster, Esq., for improvements in Electric Telegraphs. November 11; six months.

John Weems, of Johnstone, Renfrew, North Britain, for improvements in the manufacture or production of metallic pipes and sheets. November 11; six months.

Andrew Fulton, of Glasgow, Lanark, North Britain, hatter, for improvements in hats and other coverings for the head. November 11; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Nov. 6	3383	J. D. Everett	Totteridge	Protean puzzle.
9	3384	Robert Lambert and Thomas Danby	Goree Piazza, Liverpool; Toxteth-park, Liverpool	Gold-sifter.
10	3385	William Taylor	Birmingham	Inside shutter-bar.

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BROOMAN'S IMPROVED PADDLE-WHEELS.

Fig. 1.

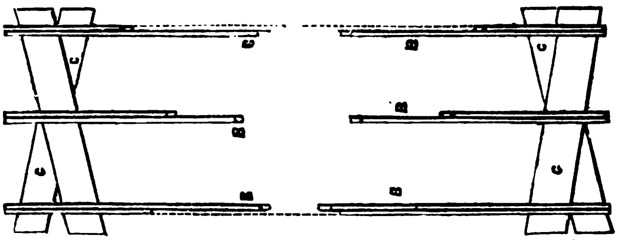


Fig. 2*a*.

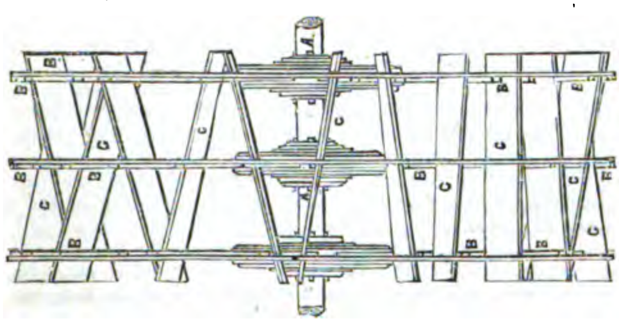
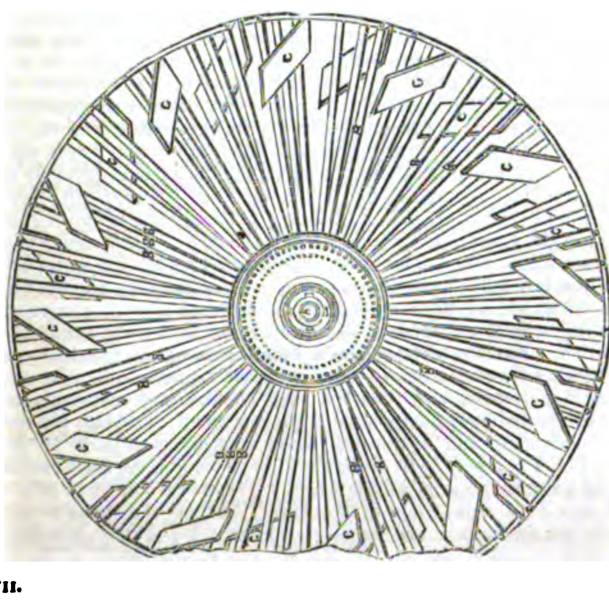


Fig. 2.



BROOMAN'S IMPROVED PADDLE-WHEELS.

(Patent dated May 4, 1852. Specification enrolled November 4, 1852. A communication from Mr. Thomas Ennis, New York.)

Fig. 3.

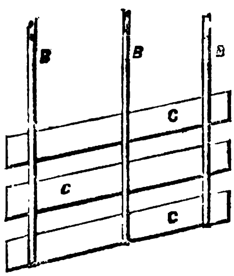
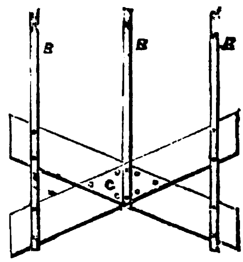


Fig. 4.



This invention is intended to remove or diminish the disadvantages attending the employment in paddle-wheels of floats placed parallel with the axis of the wheel, of which the principal are, 1st. Concussion produced by the floats on their contact with the water, and consequent loss of power. 2. Backwater, which may be distinguished as of two kinds—that raised upon the upper surface of the floats as they emerge from the water, and that dragged after the floats during their passage through the water by the pressure of the surrounding fluid to fill the space produced by the displacement of water by the floats. 3rd. Interference of the floats with ach other while in action, owing to their parallelism and their acting in the same horizontal plane. And, 4th. Loss of effective resistance by the water to the action of the floats, partly owing to the air which is drawn under water by the floats during their revolution, and partly to the disturbed state of the water on which the floats more immediately act. The means by which it is proposed to remedy these evils are as follows:—The floats are set obliquely to the axis of the wheel, and caused to enter the water partially endwise, their immersion therefore is gradual, consequently without jar, tremor, or vibration. The egress of the oblique floats from the water being equally gradual and partially endwise, there is no horizontal base offered for the water to rest on; so that before the lower end of the float has reached the surface of the water, the pressure or tendency to equilibrium of the water itself will prevent any accumulation on its upper side, and the air rushing under the rising float will prevent the water below from being forced upwards after it by the pressure of the atmosphere. Again; the floats have little or no interference with each other, because no two adjoining floats thereof will operate in the same plane, the full effect of each float being accomplished before the operation of another float in the *same plane* can take place, the floats of this new wheel acting in opposite planes alternately. The forcing of the air beneath the water arises principally from the large displacement of water by the ordinary paddle-wheel, as its floats enter the water, leaving a space into which the air, rushing more rapidly than the surrounding water, is forced or drawn underneath, by the action of the wheel in its revolution. But the oblique floats entering the water gradually, a sufficient time must necessarily elapse before their complete immersion for the water to close over them as they descend, and thus the rush of air which invariably accompanies the descent of the ordinary floats, is to a great extent excluded, the immersion of the latter commencing and continuing simultaneously at all parts of the length of each float. Fig. 1 is a part front view, showing two adjoining float-boards obliquely adjusted, and fixed to the arms of the wheel. Fig. 2 is a side view of a wheel complete; and fig. 2^a a front view of the same, showing the manner in which the oblique floats are fixed, each one in a direction contrary to that on either side of it. AA is the shaft or axis of the wheel; BB are the radii or arms of the wheel; and

CC the floats, which are bolted to the arms in the usual way, but are placed obliquely to the axis of the wheel, and also in a position oblique to each other; that is, they diverge alternately in contrary directions in parallelism with the axis of the wheel, and are so set that their ends are at unequal distances (fig. 1) from the axis of the wheel. Fig. 3 shows an arrangement in which the float-boards are divided instead of being made in a single piece, as just described; and fig. 4 shows another arrangement in which two paddles or floats, crossing each other obliquely, are fixed to the same set of arms. But the arrangement first described is that which the inventor prefers to use without, however, confining himself to any particular degree of obliquity of the floats, or divergence from parallelism with each other, or with the axis of the wheel.

The iron framing of the ordinary side-wheel can be used for the oblique arrangement without alteration, though an arrangement of the arms of the wheel to correspond with the improved mode of construction, would undoubtedly be preferable where the wheel is being newly made. With regard to the floats also, they may be of a slightly curved form instead of being perfectly straight; and, indeed, when straight floats are used, they will twist in, being fastened to the arms or radii of the wheel, obliquely to the plane thereof, so as to form sections of a screw.

TRIAL OF TUBULAR SEWERS.

The following is an account of several trial works, and illustrates the effects of altering the size as well as shape of the channel of conveyance, with a better adaptation to the run of sewer water and the service to be performed. It is contained in a Report of Mr. Hale, the surveyor, who was directed to make the trial by the General Board of Health:

"The main line of sewer in Upper George-street is 5 feet 6 inches high, and 3 feet 6 inches wide, and runs from the Edgeware-road to Manchester-street, where it falls into the King's Scholar's Pond Sewer. I have laid a 12-inch pipe, 560 feet long, upon the invert of this main line, and have built a head wall at the end of it, so that the whole of the sewage discharged by the collateral sewers above the pipe, as well as what sewage may find its way independently into the upper part of George-street, is forced to pass through the pipe.

"The whole area drained by the sewers running into the 12-inch pipe in George-street, is 213,778 square yards, or about 44 acres. Observations are being continually made on the work, and the results are as follows:—The velocity of the stream in the pipe has been observed to be four-and-a-half times greater than the velocity of the same amount of water on the bed of the old sewer. The pipe has not been found to contain any deposit, but during heavy rains stones have been distinctly heard rattling through it. When the pipe is nearly filled, the velocity and concentration of the water are sufficient to clear away any matter which may have been drawn into the pipe from the large sewers, and much of which matter it may be presumed, would never enter a well-regulated system of pipe sewers; also the force of the water issuing from the end of the pipe is sufficiently great to keep the bottom of the old sewer perfectly clean for 12 feet in length; beyond this distance a few bricks and stones are deposited, which increase in quantity as the distance from the pipe increases. Beyond a certain distance mud, sand, and other deposits occur to the depth of several inches, so that the stream there is wide and comparatively sluggish, and being dammed back by the deposit, exerts an unfavourable influence on the flow of water through the pipe. On the invert of the original sewer, which now forms the bed of the pipe, deposit was constantly accumulating, and was only partially kept under by repeated flushings. The superficial velocity of the water in the pipe is generally three, four, and five times greater than the superficial velocity which obtained, *under the same circumstances*, in the original sewer, and the velocity of the *whole mass of water* in the pipe approximates much more to its surface velocity, as ascertained by a float, than does the velocity of the *whole mass* of water in the sewer approximate to its own surface velocity.

"On one occasion I had the sewer in Upper George-street carefully cleaned out immediately below the pipe, and then caused a quantity of deposit, consisting of sand, pieces of bricks, stones, mud, &c., to be put into the head of the pipe; the consequence was, the whole of the matter passed clear through the pipe (560 feet long), and much of it was deposited on the bottom of the old sewer, at some distance from the

end. When the pipe was flowing nearly half full, two pieces of brick, one weighing one pound and three quarters, and the other one pound thirteen ounces, were impelled by the force of the water through the whole length of pipe, and struck the legs of the man at the end of the pipe with considerable force. A live rat was also washed with great violence through the pipe, and struck the legs of a man with such force as proved the rat had no control over its own motion. When the water was only 5 inches deep in the head of the pipe, nearly a whole brick, weighing four pounds, was put in it; it was heard for a few seconds moving down the pipe, but was not caught at the end.

"(The bulk of the stream at the head of the pipe is diminished to about half its dimensions when it arrives at the end, the velocity being greater.)

"A great number of irregular-shaped stones, each of several ounces weight, were washed through the pipe with the same apparent ease as marbles, and the distinct rattling noise I occasionally heard them make, might convey a correct notion of the considerable force with which they must have been impressed.

"All the foregoing results were effected when the pipe was either only half full, or less than half full of water, which has been gauged in the pipe."

It may be here observed, that vitreous pipe-sewers, if properly made, will bear very considerable internal pressure. The smaller sized stoneware pipes have been tested to several hundred feet. Common red-ware clay pipes of 6 inches have been tested to between one and two hundred feet of pressure. Pipe-sewers and drains, properly laid, and cemented with Roman cement, may therefore be used under pressure. Experience, as well as a consideration of the difference of structure, shows that it is not safe to use sewers of the common brick and mortar construction full. With respect to a great number of the recently-built and most expensive brick sewers in the metropolis, it is reported by the officers engaged in the subterranean survey, "that with one-fourth the strength of a man, you may drive a searcher through the brickwork and several feet beyond; then by using the searcher as a lever, you may shake the whole sewer for a yard round;" and that the works cannot be reasonably expected to stand for more than ten or twelve years, much less any full flows of storm-water.

"The house-drains connected with the experiment in George-street are in most respects like the rest of the house-drains of the metropolis; the general characters of the whole are great size, irregularity of form, and filthy and bad-smelling condition. The variations in size are from nearly half a square foot to four square feet cross section, and the different forms include the circle, the square, and square bottom and sides with semicircular top; their inclinations seem not to vary more than from horizontal to a fall of two inches in ten feet. Their condition with respect to quantity of matter deposited in them does not seem to be regulated by their inclinations. This may be accounted for by the fact, that their wide and irregular inverts spread the small streams and destroy their force, and cause matter to lodge with greater security. Many of the ends of the drains are so dilapidated, that their original form cannot easily be distinguished; but enough can be determined to know that the sum of all their areas (480) would exceed the area of a circle of 30 feet in diameter.

"Much of the rubbish and obstructions in the house-drains have been found to consist of heaps of pieces of brick and mortar, which from time to time have fallen from the soffits and sides of the drain, as it has progressively become dilapidated. Various species of fungi shoot out from the interstices of the brickwork; and the existence of old cobwebs around the sides, and sometimes nearly covering the mouth of the drains furnishes another proof, in some instances, that the drain has not been for a long time, if ever, half filled with water. These old drains are the special harbours of rats and other vermin."

An inquiry was directed to be made as to the expense of laying down a mile of 16-inch pipe in an old sewer, with junctions of 4-inch branch pipes to every house-drain made good, when it was estimated that the expense would be 254*l*. 14*s*. 5*d*. per mile; and it appeared that in many such situations as those where, according to the views of various engineers, cleansing by flushing or hand labour would be required, such a line of pipe would keep the sewer entirely clear of deposit, and, so far as the sewer itself was concerned, clear of smell, while it would greatly diminish, if not prevent, the circulation of foul gases from the house-drains through the sewers. According to the Report of Mr. Lovick, the present expense of flushing in some districts is 2*l*. 10*s*. per mile per week. In the newly-cleansed districts it was 29*l*. per annum per mile. Even this expense was owing to old accumulations now in course of removal. In the Holborn and Finsbury division, where the flushing is regular, the average expense of keeping the sewers clean by flushing, at piecework, is 17*l*. 5*s*. per mile per annum. Now, the total cost (assuming the practicability of ar-

rangements for the manufacture of redware pipes, such as are described in the Appendix, which could only be done on a very large scale), such a tubular sewer as that above described by Mr. Hale, allowing for a 16-inch pipe instead of a 12-inch one, and spreading the payment over twenty years, would not be more than 19*l.* 8*s.* 5½*d.* per mile per annum, if executed on a large scale at the prices herein described. (See *Appendix*, Cost of Tubular Drain-pipes). Under the flushing system in the least uncleanly sewers district, the expense of finishing represents the expense of removal of 517 loads of detritus and decomposing refuse at 8*d.* per load, spread in portions over a mile of surface 3 feet wide on the average, until it is removed at weekly and fortnightly intervals. At an extra annual expense of 2*l.* 3*s.* the retention and spreading of a proportionate part of these 517 loads may be prevented in streets where there happens to be a sufficient fall.

It will be obvious that by this calculation it is not intended to convey the meaning that a 3-feet sewer would suffice for the drainage of the metropolis, but merely that assuming the average of the whole of the house-drainage alone to be that which was found in this experiment, and that the whole were flowing in one channel, at the same rate, a 3-feet sewer would suffice to convey it.

IRON LIGHTHOUSES.

We extract the following article from the last Number of the *Scientific American*, from which may be collected some idea of the great field which exists in America for English skill and enterprise to display itself in:

So long as wood is cheaper than iron in our country, it would be used in preference to it for the sake of economy in the first cost. Every year, however, tends to increase the scarcity and price of timber, and iron is every day extending in use, and it will yet be as common to see iron houses of all kinds as it now is to see those of wood. We shall not live to see this result, but we can see it *afar off*. In our city, iron pillars are universally taking the place of those made of wood and stone, and in Britain, five iron ships are now built for one of wood. The employment of iron in marine structures forms an important era in respect to its use for lighthouses. The great expense and difficulty heretofore experienced in forming foundations of stone for lighthouses in sand banks, and in yielding soft places, have been overcome by Mitchell's iron screw piles, and Potts' iron cylinders, and then raising the superstructure on these. We have a letter before us from Mr. C. Pontez, stating that he is progressing with his foundations of iron cylinders for a lighthouse in the course of erection fifteen miles below Baltimore. A number of these cylinders are now sunk, and when all completed, they will form two concentric circles, the outer one 23 feet in diameter, composed of cylinders 26 inches in diameter each, and 1 inch thick; the inner circle will be 17 feet in diameter, with cylinders of 17 inch diameter. These cylinders will be filled with concrete, capped with iron plates, and all the caps connected together by wrought-iron ties, thus forming a continuous circuit. Around and within, the circles will be filled with large masses of granite to the level of low water, and on the top of the iron circuits the regular courses of masonry will be laid. The site is two miles from the shore, in water 10 feet deep, and thus a strong and permanent lighthouse will be built by the employment of iron foundations at an expense of less than one-half of what a stone foundation could be laid; indeed, the employment of iron enables our marine engineers to build lighthouses in situations where it would be utterly impossible to build stone towers.

At the Exhibition of the Franklin Institute, now open in Philadelphia, there is the model of an iron lighthouse by Merrick and Son, to be built on screw auger piles bored 12 feet into the coral reef at Sand Key, Florida, it has a base of 50 square feet, will be 132 feet high, and weighed 450 tons.—The lighthouse on Carysfort Reef, Florida, completed by the Topographical Bureau this year, is a wonderful iron structure, and was made by Merrick and Towne, of Philadelphia. It is built on piles arranged upon the angles and centre of an octagon; the heads of these piles are united by iron ties, and on this arise courses of iron pillars, and a strong central column from the centre foundation to a level with the top of the upper series of pillars—from this central column there radiate, at proper levels, iron girders of great strength, which, added to the horizontal ties extending from one pillar to another, form a combination so compact and stiff that no force of the wind, it is supposed, will ever disturb it. For the residence of the keepers of the light, a cast-iron dwelling of a circular and conical form is fitted to the above described frame-work of pillars, ties, &c., at a point of 35 feet above the level of the reef, and 20 feet above the highest tides.

This dwelling consists of two stories. The lower one being 8 feet in height, and 40 feet in diameter, is designed for the de-

posit of stores, the kitchen, &c. It is fitted with 8 windows, and 16 bull's eyes—the former for air, and the latter for light. It contains six iron tanks for water and oil. The upper story is divided into six rooms, with a hall in the centre to allow a free ventilation in all the apartments. There is a door at each end of the hall, and a large window in each room. Surrounding this story is a gallery, exterior to the house, 5 feet in width, where the keepers may exercise.

From the centre of the hall rises a spiral staircase to the top of the structure. This staircase is inclosed by an iron cylinder, the whole weight of which rests upon the roof of the dwelling house. On the top of the structure is placed the watch-room and lantern, or light room, fitted to contain a Fresnel apparatus of the largest size, that will produce a light of the highest power. The diameter of the structure at the base is 50 feet, and 20 feet at the level of the watch-room floor. The height of the entire work above the surface of the reef is 127 feet, and the height of the centre of the light 115 feet.

It was for this lighthouse that the Fresnel Light was intended, which was sold in the New York Custom-house for old iron and glass, when in charge of the Topographical Engineers, and not under that of the Lighthouse Board as we have since been informed. The benefit of iron in marine structures, such as lighthouses, was first displayed by A. Gordon, C.E., of London, who, in 1841, erected one on Morant Point, in the Island of Jamaica, on a position difficult of access, and where, from the frequency of earthquakes, no stone lighthouses above two stories high could stand. This lighthouse is made of cast-iron, and has stood several severe shocks of earthquake. A cast-iron lighthouse was erected by the same engineer on the Island of Bermuda, in 1845; it is 105 feet high, and is provided with a Fresnel Light, which can be seen at thirty miles distance. Owing to the great expense, or total inability of erecting stone structures in many exposed situations, we cannot but feel grateful that iron meets and surmounts all such difficulties. The iron lighthouse in Bermuda has been the means of greatly reforming the habits of a large number of the inhabitants who formerly gained their livelihood as wreckers, an occupation not very favourable to the development of the best qualities of humanity. The iron lighthouses on the dangerous Florida Reefs will also be the means of doing a vast amount of good in this respect. Within view of o first-class light on Carysford Reef, there was wrecked in three years, and four months property to the amount of 1,147,500 dols. The wrecking fleet on the Florida Reefs amounts to 47 vessels with a tonnage of 1,200 tons, and crews amounting to 350 men. At Key West, Florida, the amount of salvage decreed to the wreckers, in 1848, amounted to 199,140 dols., and the wrecked vessels and cargoes amounted to 1,282,000. The iron lighthouses on the coast of Florida, if they do not prevent all this great amount of wreckage, will no doubt prevent nearly the whole of it; success then, we say, to our iron lighthouses.

IRON SHIP-BUILDING AT BIRKENHEAD.

(From the "Liverpool Albion.")

On Saturday, at half-past 12 o'clock, the *Faith*, a beautifully modelled screw steamer, built for the African Mail Company, was launched from the building-yard of Mr. John Laird, at Birkenhead. She looked splendid on the water; and, judging from her smart apparance, she will tend considerably to increase the already fair fame of Mr. Laird as a builder of iron screw steamers. She is intended for the station on which the *Forerunner* is at present placed. Her dimensions are, length, 200 ft.; beam, 30 ft.; and burthen, about 900 tons. The engines, which are on the direct-action principle, have been manufactured by Messrs. Fawcett and Co., of this town. Her stem, which has a beautiful curve, is surmounted by a neatly-carved figure-head of a female, half length.

She has cabin-houses running almost the entire length of her spar-deck, which are fitted with admirable arrangements for securing light and ventilation; the latter so necessary in vessels visiting tropical climates. By this plan may be used either glazed windows or Venetian blinds, or even, if necessary, the orifice may be left quite open. She has a large topgallant forecastle, with accommodation for the seamen. She has an elliptical or round stern, of rather a novel construction, the framing and plating being carried for some distance from the stern above the upper deck in the form of an arch, making a spacious wheelhouse and other apartments, the roof of which is planked; the effect of the whole being to give the after part of the vessel a neat and light appearance. The hull of the *Faith* is coated with two different preparations for preserving the bottom of iron vessels, the lower part having the well-known one of Peacock's, and above that, for some feet, a new preparation, called "Macintosh's Patent Caoutchouc Composition," which is said to be equally applicable to either iron, wood, or coppered ships, having also, according

to its proprietor, the peculiar, and, if true, very desirable property of greatly increasing their speed, by its presenting a slippery surface. Alongside of the *Faith* there is also another vessel, named the *Hope*, for the same company, in an advanced state, and expected to be launched in a few weeks; she is of similar mould and dimensions to the *Faith*, but the engines for her are manufactured by Messrs. Forrester and Co., so that there is considerable speculation as to which of the two great engineering establishments will make the fastest boat.

It is a real pleasure for any one who derives gratification from an inspection of interesting works in a state of progress, to pay a visit to Mr. Laird's yard; for, besides the vessels thus briefly alluded to, there are several large orders in the course of execution; and, owing to the great facilities of the establishment, business is despatched with remarkable celerity, giving employment to five hundred hands—a larger number, we believe, than has ever been assembled together in one yard in this district. On a recent visit we observed a fine boat of 1,300 tons, in course of being framed, to be built for the South American and General Steam Navigation Company, and intended for the Brazilian trade. In another part of the yard we saw the keel and portion of the framing of a second boat for the same parties, to be laid down in the place the *Faith* occupied. Some idea of the large amount of shipbuilding executed by Mr. Laird, since his establishment commenced at Birkenhead, may be formed, when we state that he has now his ninety-fifth vessel in hand there, a tolerably large fleet in themselves; and it is to be regretted, for the sake of the prosperity of the neighbourhood, that circumstances should have induced that gentleman to contemplate the removal of an establishment which provides a livelihood for so many men. Mr. Laird's new yard on the Lancashire side of the river is being put into order, and preparations are being made for the erection of several large steamers.

MR. M'CONNELL'S NEW EXPRESS ENGINES.

On Thursday the first of the magnificent new class of passenger-engines, construoted upon the patent of Mr. M'Connell, the locomotive superintendent of the London and North-Western Railway, made an experimental trip from Wolverhampton to the Euston-square terminus.

The locomotive in question is a six-wheel one, with 7-feet driving-wheels, the leading wheels being 4 feet 6 inches, and the trailing wheels 4 feet. The useful novelty of the machine consists in the construction of the fire-box, and the means which have been resorted to for the purpose of producing perfect combustion in the fire box, and a consequent economy in the consumption of fuel. To effect this, Mr. M'Connell has thus constructed his engine:—The fire-box has been put forward 4 feet 9 inches into the barrel of the boiler, forming what may be termed a combustion chamber. This has enabled him to obtain no fewer than 260 superficial feet of heating surface in the fire box. For the purpose of producing as nearly as possible perfect combustion, a number of the stays connecting the combustion chamber with the shell of the boiler are tubular, and the air being drawn through them, impinges upon the flames. This produces a perfect mixture of the gases, and necessarily the largest amount of serviceable caloric is evolved. The tubes, 303 in number, are 7 feet in length, and an inch and three-quarters in diameter. The whole of the heating surface is, therefore, about 1,240 superficial feet.

The value of this arrangement will be understood from the fact, that on Thursday the engine, in 45 minutes, got up sufficient steam to move her.

The extreme bearings of the engine are 16 feet 10 inches; the cylinder is 18 inches in diameter; the length of stroke, 24 inches: and experiment leads to the belief that she will be able to work with a 6-inch blast pipe. To bring down the centre of gravity as low as possible, the under side of the boiler has been "recessed," for the passage of the crank of the driving-axle. Another novelty in the construction of the engine is, that the steam pipe presents a broad, flat surface to the heated air, as it passes from the tubes into the smoke-box, so that the steam is in a manner dried as it passes into the cylinder. The stays to this form of steam pipe are tubular, and the heat from the boiler passes through them, and assists in "drying" the steam before its effective force is given to the pistons.

The engine is as worthy of notice for the rapidity with which it has been constructed and the excellence of its workmanship as it is for the useful novelty of its construotion. Two of this class of engines have been delivered to the London and North-Western Company—one built by Messrs. Fairbairn, of Manchester, and the other by Messrs. J. B. Wilson, of Leeds. The one tried on Thursday was built by the latter firm. The engine itself was "erected" in the short period of eight weeks, and was delivered within four months from the date of the order for her construction, including the delays which will occur in the supply of materials. Both the above firms have done

wonders in the celerity of construction; but the latter, who received their order several weeks after their able competitors, appear to have gone "ahead," as they had, we are informed, their engine at Wolverton on the very day that Messrs. Fairbairn sent theirs to that locomotive station. The engines of both houses are fine specimens of locomotive manufacture. That of Messrs. Wilson and Co. was much admired at the Euston terminus. It is, in solidity and finish, not inferior to the broad-gauge "Lord of the Isles," so much spoken of at the Great Exhibition, and is at once a credit to its maker, and an honour to the mechanical skill of the country.

The engine in her trip on Thursday was not, as she had only just left the workshop, tried at a higher speed than about sixty miles per hour, at which rate she was steady. The intention of this new class of engines is to take trains at high speed and small cost. This engine would easily take an express train from London to Birmingham in two hours, or even in a shorter time were it desirable, and will probably prove very economical in practice.

A trial trip was projected for Monday last, on which occasion it was intended that one of Mr. M'Connell's new engines should be attached to a train, and that a party consisting of the directors, their friends, and a number of engineers and men of science, should proceed to Birmingham, dine there, and return to the Euston station. Two hours would be allowed for the journey from London to Birmingham, two hours for dining at Birmingham, and two hours for the return journey to London. The long continuance of the rain, however, and the inundated state of the country in many parts of the line, had unfortunately brought the embankments and cuttings into so shaky a state, and the traffic of the line being at this time so greatly increased by the thronging into the metropolis of the multitudes who desire to see the grand climax of the melancholy event which occupies men's minds, that it was deemed expedient to await a more favourable opportunity. The trip will shortly take place, when we hope to see this great improvement in our steam locomotive system receive the sanction of authority.

FORDER'S RAILWAY FENDER.

A trial of the fender invented by Mr. A. T. Forder, of Leamington, for deadening collisions on railways, took place at Leamington on Saturday last, of which, and also of the construction of the apparatus, as exhibited in the experimental model, we extract the following particulars from an article in *Aris's Birmingham Gazette*:—"The improved fender consists of two parts, one called the 'striker,' and the other the 'receiver.' The striker is formed of a plate of metal, into which a number of strong bars of steel, of different lengths, are fastened. The receiver is a similar plate with apertures, over which are placed pieces of spring steel, the centres of which correspond with those of the bars in the striker. The two bars are fixed together, so that the latter may slide towards the receiver, and each bar of the striker be exactly opposite the centre of its antagonistic steel plate. One fender is intended to be fastened to each end of every carriage. As the striking bars are of different lengths, and project from the plate, the centre part of the plate being struck, the bars will successively bend and break its opposing steel-plate; and, if there are a sufficient number of them, the fender will absorb the whole of the impelling force, and, in case of a collision, stop the train without injury to passengers or carriages, inasmuch as the whole of the whole of the blow will have been expended in breaking the plates.

The working model exhibited on Saturday consisted of a railway 5 feet high at one end, and 3 inches at the other, being 30 feet in length, and forming an inclined plane or fall of 1 in 6. Upon the highest position of the rails were placed two carriages fitted up with glass windows, and in all respects similar to first and second-class railway conveyances. At the end of each was appended a model fender of the above construction, and upon a given signal the train, each carriage of which weighed about 60 lbs., ran down the rails against a block placed at the bottom. The result of the collision or blow was, the plates in the fender were nearly all broken, while the carriages remained perfectly uninjured. There was no perceptible recoil, and the train was brought to a dead stand in an instant."

NEW IRON TRUSS BRIDGE.

We learn by the Troy (New York) papers, that a bridge has been erected over the creek in Second-street, that city, by the inventor, Dudley Blanchard, in company with Louis Fellows, of that city. It is an iron truss bridge of 73 feet span, composed of 24 separate castings, after six different patterns—four to each. It weighs about five tons, of cast-iron, and has about two tons of bolting. It has been tested with 40 tons on it, and no sign of deflection exhibited.

The usual plan of making truss frames, is to have all the braces equal with a top and bottom chord of uniform size throughout the whole length. This bridge is constructed with braces and chords of various proportions—each part of the truss frame being made and proportioned to the strain which it has to sustain. He employs less material in making a bridge of equal strength to that of the uniformed truss bridges.—Messrs. Blanchard and Fellows are now engaged roofing the entensive rolling mill of the Albany Iron Works, a building 336 feet long by 135 feet wide, with an iron roof, supported on the same principle.

THE FLOODS.—EXTENSIVE DAMAGE ON THE GREAT WESTERN RAILWAY.

During the whole of Monday morning the traffic on this line was impeded, in consequence of a series of slips having occurred during the night between Paddington and Hanwell station. The early down train was unable to get further than four miles down the line, when the engine-driver and guard discovered it to be flooded for several miles, in consequence of the water breaking through the sides of the cutting; and it was further discovered that in about thirty or forty places extensive slips had taken place, principally on the up-line. Finding the line impassable, intelligence was at once sent to Paddington, and Mr. Sanders, the active manager, visited the spot, and seeing the serious nature of the accident, gave orders to suspend all down trains, and sent a body of navigators to clear the line. In consequence of this arrangement, no train left London until 11 o'clock, when the down rails were cleared. In the meantime the up trains began to arrive at Hanwell Station, and a passenger from Bristol furnishes us with the following particulars:—"I started from Bristol by the special train at half-past 6 o'clock, and heard, on arriving at Swindon, that the line was much flooded higher up. On arriving at Hanwell Station, we found two more trains in front of us unable to get on. All the danger signals were promptly put up, as the express was close behind, and in consequence of the precautions taken each train as it came up was warned of the danger. We were detained at this spot between two and three hours, by which time there were no less than six trains on the up-line close to each other. Mr. Sanders was present, and did everything to facilitate the clearing of the line and to prevent accidents. Eventually we were able to proceed. During the whole distance between Hanwell, to within four miles of Paddington, the line was under water, in some places more than two feet deep. In many parts the sides of the cutting were washed completely over the line, and gangs of men, as we passed, were engaged in removing the *débris*. The train which should have arrived at Paddington by 10 o'clock did not reach until half-past 1, and the express shortly after. Many thousands of acres on each side of the line were covered with water."

The Shropshire Union Canal.—A serious accident has happened to this canal between Long and Wellington, in Shropshire, by which 50 yards of embankment have been thrown down. Not less than 200 men are actively employed to repair the breach, and it is calculated that it will take at least a fortnight to accomplish the task.

PATENT LAW AMENDMENT ACT, 1852.—SUPPLEMENTARY RULES.

By the Right Honourable Edward Burtenshaw Lord St. Leonards Lord High Chancellor of Great Britain, the Right Honourable Sir John Romilly Master of the Rolls, Sir Frederic Thesiger Her Majesty's Attorney General, and Sir Fitzroy Kelly, Her Majesty's Solicitor General, being four of the Commissioners of Patents for Inventions under the said Act.

Whereas, by order of the Commissioners, dated 15th of October last, the applicant desiring his Letters Patent to extend to any of the Colonies, is directed to specify in his petition for the same particular colony or colonies to which he desires it to extend;

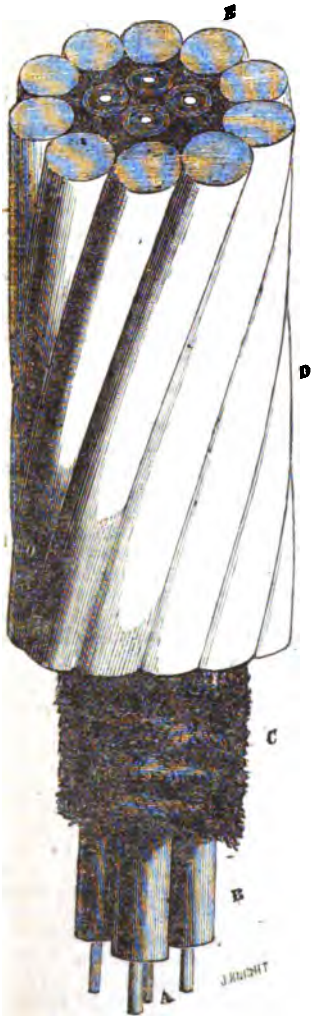
And whereas many petitions left at the office of the Commissioners, before and after the date of the said order, pray for the extension of the Letters Patent to all Her Majesty's colonies and plantations abroad;

It is ordered, That in every such case the applicant or his agent shall leave at the office of the Commissioners a notice in writing, either specifying the particular colony or colonies, to which he desires his Letters Patent to extend, or withdrawing altogether his application to extend his Letters Patent to the Colonies; and no reference of such Petition shall be made to the law-officer for his warrant for the sealing of Letters Patent until such notice shall have been left at the said office.

(Signed) St. Leonards, C.
John Romilly, M.R.
Fred. Thesiger, A.G.
Fitzroy Kelly, S.G.

Dated the 8th November, 1852.

THE FRENCH SUBMARINE TELEGRAPH.



The accompanying engraving represents the structure of the cable which has stood the storms of the English Channel during the past twelve months, and through which messages have been passed from England to France, and *vice versâ*, frequently at the rate of four hundred per week, without a single interruption. It is a most singular fact, but one which we state on the authority of the first telegraphic engineers of this country and the continent, that no land telegraphic communication has yet been found to have such perfect insulation as the submarine cable from Dover to Calais. The peculiarly valuable insulating properties of gutta percha appear to be, indeed, improved rather than injured by immersion in the salt water.

The following references to the engraving will convey a clear conception of the cable:

A, the four conducting copper wires.

B, covering of gutta percha. The double covering of gutta percha is shown at the section E.

C, spun-yarn, saturated with tar, wound round the covered wires, and filling up the interstices, so as to form a core upon which the galvanized wires are laid.

D, outer protection, consisting of ten galvanized iron wires.

E, section of the cable complete.

The four conducting copper wires were insulated with a double covering of gutta percha, by the Gutta Percha Company, at their works in Wharf-road, City-road, under the direction of Samuel Statham, Esq., whose perseverance and talent have given no small impetus to submarine and subterranean communications.

The outer protection of ten iron galvanized wires was manufactured by Messrs. R. S. Newall and Co., of Gateshead, at their temporary works in Wapping.

We have pleasure in closing this short notice (which supplies some omissions in our notice of last week) by stating that the wires insulated by the Gutta Percha Company for the Belgian submarine cable are now receiving their outer protection at the works of Messrs. Newall and Co., at Monk Wearmouth, and we hope to have the gratification of announcing, ere long, that the telegraph is in active work between London and Ostend.

The Central Railway to Exeter.—The recent defeat of the central scheme by the South-Western Company, has not left us entirely without the hope of getting a line through this neglected district. The Great Western party are now actively engaged here in surveying and mapping this portion of their proposed line, from Exeter to Maiden Newton.—*Local Paper.*

COURT OF EXCHEQUER, NOVEMBER 13.

Power under the New Patent Law to Compel the Inspection of a Patented Article.

SHAW v. THE GOVERNOR AND COMPANY OF THE BANK OF ENGLAND.

This was the first proceeding in the superior court under the Patent Law Amendment Act.

The action was brought against the Bank of England for the alleged use or infringement of a patented machine for numbering or lettering in succession the pages of books, the invention of the plaintiff.

Mr. Hawkins moved for a rule *nisi*, calling on the defendants to show cause why they refused to permit the plaintiff, or some one on his behalf, to inspect a machine now in use in the Bank of England for the purpose mentioned above, and which he had reason to believe was constructed in conformity with the specification of his patent. The application was made under the 42nd section of 15th and 16th Vict., c. 83, the terms of which are as follows:—"In any action in any of Her Majesty's Superior Courts of Record at Westminster and in Dublin, for the infringement of letters patent, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting then for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such Court or judge may seem fit.

Mr. Baron Parke having referred to the Act,

The Court granted a rule *nisi*.

Rule accordingly.

THE FUNERAL CAR OF THE DUKE OF WELLINGTON.

This elaborate and beautiful piece of workmanship had no fewer than eighty workmen constantly employed upon it, day and night, in fixing the bronze ornaments, after its removal from Messrs. Barkers', the builders, to Pimlico. When Messrs. Banting had received the order to carry out the arrangements, not less than twelve hundred men and women were engaged upon the work, and continued incessantly. In this large number were included artists, casters, metal finishers, coach-builders, embroiderers, upholsterer, decorators, cabinet-makers, carpenters, engravers, and other mechanics, besides a large number of labourers.—*Advertiser.*

THE IRON TRADE.

Great anxiety continues to be felt in commercial and manufacturing circles on the subject of the prospects of the iron trade. Another advance of 20s in the ton before Christmas is now deemed certain, in consequence of the unprecedentedly large orders which have been received from the United States by the *America*, and subsequently by the *Baltic*. Rails, rods, and plates are in great demand, and the stocks are evidently inadequate to the requirements. In one instance alone a contract has been taken for 20,000 tons of rails, at 35 dollars cash on delivery. Exclusive of these foreign orders, there is a great demand for plates for ship-building, and for rods and rails for home consumption. The foreign trade is, therefore, so extensive as to justify, in the opinion of the leading houses, the proposed advance, although the orders for the home trade are comparatively limited and speculative.

Notwithstanding the increased demand, it is not improbable that the make will be less extensive for the next three months than it has been during the last quarter. The want of coal, the weekly advances of wages required by the miners, and their enormous loss of time, as is unfortunately too common with them in good trade, will all combine to render the execution of the orders difficult, and enhance the price of iron. Several of the principal firms have already refused large orders for rails at the existing prices. What the effect of this rapid and extraordinary advance in the price of iron upon the general hardware trade of the town may be, it is impossible to foresee; but be the result what it may, the ironmasters are not likely to forego present gain to future apprehensions.

The Board of Trade returns for the month ending October 10, exhibit the extraordinary increase of 138,392*l.* in our exports of iron.

South Staffordshire.—The iron trade of South Staffordshire continues extremely brisk. One of the largest firms in the district has issued a circular, in which they state they will not take any more orders this year; and it is confidently expected, although the price of some descriptions of iron has

risen 50 per cent. within the last three months, that another advance will be declared at the next quarterly day; some go so far as to state that an advance of 20s. per ton is inevitable before Christmas. The orders received by the last packet from the United States are unprecedentedly large. Rails, rods, and plates are in great request. The demand is greatly in excess of the supply; in one instance alone a contract has been taken for 20,000 tons of rails at 55 dollars cash on delivery. In addition to this glut of foreign orders, there is a large demand for plates for ship-building.

Scotland.—The rapid advance in the price of pig iron in Scotland from 35s. to 58s. per ton has had the effect of increasing the means of production as follows:—Additional furnaces going this year in Ayrshire, 14; additional furnaces building in Fifeshire, 8; additional furnaces building in Ayrshire, 4; total, 26. These twenty-six furnaces will produce, on an average, about 140 tons each per week, or an aggregate of nearly 180,000 tons per annum.

Glasgow Pig-iron Market.—Glasgow, Nov. 13.—Our pig-iron market has been very quiet this week, with a limited business doing. The attempt by two or three speculative houses to raise the price by buying and calling in all the warrants in circulation is looked upon with much suspicion by the trade, who meantime decline to operate. Warrants are held to-day at 58s. with buyers at 57s. 6d. cash.—*Times*

America.—By the royal mail steam-ship, *Europa*, which arrived at Liverpool on Tuesday, with advices from New York to the 3rd. inst., we learn that the American iron market had become inactive. Sales for immediate delivery had been made at 30 dollars, but for delivery in February and March large quantities had been offered at 35 dols., 30 cents., and refused.

Decay of the Larch.—Within the last twelve or fourteen years a mortality began amongst the larch trees of a few years' growth. The disease spread to the older trees, and those of fifty, sixty, and seventy years old are now dying in the same manner. I do not know how far south the mortality has spread, but I know it exists in Oxfordshire, and northward in Cumberland, Northumberland, and throughout the south of Scotland. I venture to propose as a query—what is the cause of this general decay and death of the larch tree in Britain? Perhaps it might be worth while to procure seed from the shingly and rocky slopes of the Alps and Apennines, its original habitat. None, I believe, who know anything of the larch will dispute that the loss of it in this country will be a great one.—*Notes and Queries.*

Commerce and the Electric Telegraph.—The following facts serve to illustrate the advantage of vessels calling for orders at ports which, like Plymouth, are connected with the metropolis by telegraph. The brig, *Catharina*, Captain Liddle, from Odessa, with a cargo of wheat, bound to Falmouth for orders, being unable to fetch that port, put into Plymouth on Tuesday night, the 26th ult. The master landed the next forenoon (Wednesday) when he was advised by his agents there, to announce his arrival to his consignees in London by electric telegraph. He did so, and the next morning their correspondents at Plymouth received instructions from there to take and forward samples of the cargo. This was done on Thursday by the evening mail train, and on Friday the master received orders by telegraph whither to proceed to discharge. Had there been no telegraphic communication available, the above operation could not have been accomplished, and the master received his orders, till Sunday; so that by means of the telegraph 48 hours were saved, and had the merchant in London chosen to have telegraphed for the samples, another 24 hours would have been gained.—*Advertiser.*

Westminster New Bridge.—The Commissioners of her Majesty's works and public buildings have given notice of their intention of introducing into Parliament a Bill for the purpose of enabling them to pull down the present bridge and to erect a new one in its place. The principal clause in the present Bill sets at rest all the doubts which have been raised as to its being the intention of the Commissioners to erect the bridge lower down the river, for they ask for powers to "enable them to construct a bridge from or near the stairs or landing-place at the foot of the present bridge, on the Middlesex shore of the river, to or near the stairs or landing-place of the said bridge, on the Surrey shore of the river, in the parish of St. Mary, Lambeth." The Commissioners also intend asking for powers to enable them to materially alter the approaches to the present bridge.

New Railway to Hammersmith and Acton.—During the past week a large number of engineers and surveyors have been engaged in perfecting the necessary plans, levels, and arrangements, on behalf of the Directors of the North and South-Western Junction Railway, who have given notice of their intention of introducing into Parliament a Bill enabling them to construct a new line of railway, commencing by a junction with

their present line at Acton, and terminating at Chiswick. The course marked out is stated to be particularly free from engineering difficulties of any kind, and we may state, that it is the intention of the Directors, should they obtain this Bill, to have the permanent line laid with a double row of rails. This railway, although only a few miles, will accommodate the inhabitants of Acton, Shepherd's Bush, Turnham-green, Fulham, Hammersmith, Ealing, Brentford, and Chiswick. The money is proposed to be raised either by the issue of preference shares, or by borrowing on mortgage or bond.

The Widow of Dr. Birkbeck.—The late Dr. Birkbeck, the chief founder of the Mechanics' Institute, and who at his own cost—both in time and money—largely contributed to the spreading of education amongst English mechanics — died, we regret to say, impoverished, and leaving his widow without provision. A communication of the bereaved lady's position was made to the Prime Minister, and a memorial, most numerously and respectably signed, prayed that some stipend from the Civil List should be allowed to her. In reply to this memorial, an offer was communicated from Lord Derby of a pension (charged on the Civil List), of 50*l*. a year. This pension, however, was by the special advice of Mrs. Birkbeck's friends, instantly declined.—*Advertiser.*

Erie and Cleveland Railway.—The line of travel along the whole lake shore, from Erie to Cleveland, Ohio, will be completed and in full operation by the 1st of November, so that the obstruction hitherto experienced in the winter season from the closing of the lake will not be felt in the coming winter.—*Scientific American.*

INSTITUTION OF CIVIL ENGINEERS.

The second Meeting of the Session took place on Tuesday, November 16, when the evening was entirely occupied by the discussion of Mr. W. A. Brooks' paper "On the Improvement of Tidal Navigations and Drainages."

It was contended that the use of groynes was advisable, as a means for the regulation of the sectional area of the Channel, which could only be accurately defined by practical experience. In some cases it would be better to combine them with training walls, on opposite sides of the river. It was not considered that two classes sufficed to distinguish the differences existing between rivers, and that their several characteristics and circumstances must be minutely studied, to determine the mode of treatment. The Wye and the Avon were quoted as rapidly rising rivers, and yet being without bars at their mouths; to which it was replied, that those streams were not cases in point, that they were mere tributaries, whose mouths were traversed and swept clear by the rapid current of the Severn; and that this latter river illustrated the position assumed, as there was a great loss of tidal range between Beachley and Framilode, the Channel wandering through a range of shoals.

The successful improvements executed at the entrance of Newhaven Harbour by Mr. Stevens were alluded to.

The treatment of the Dee by groynes, and the Clyde, by training-walls, was examined, and it was argued that the inconveniences experienced in the former case from the washing out of deep pools, at the points of the groynes, must be attributed to the injudicious extension of those structures, whence the navigation was too violently contracted, the freshes flowing over them, and removing the deposit from between them. Rennie's Report on the Clyde, in 1807, showed that the irregularity of depth at the points of the groynes previously erected by Golborne, was not anywhere 12 inches more than elsewhere in the Channel. With reference to the wide expanse, or "pouch" form of the Mersey, above Liverpool, which it was urged was of utility in scouring the bar on the ebb, it was contended that the main body of water would pass off with the early ebb, without producing any beneficial effect; and it was shown that in that part the loss of tidal range was considerable, from the great expanse covered at high water, but which was shoal at low-water.

The improvements of the Thames, by the removal of the shoals, and the construction of training-walls, were described, and it was suggested that it might be beneficial to use groynes in the bays which had produced the shoals now in course of removal.

Fully admitting the impossibility of generalizing in River Engineering, it was still urged, that there were more similarity between cases, than was generally understood, and attention was directed to the inevitable effect, arising from the conflicting action, between the ebb and flood-tides, at the mouths of rivers, having a rapid rise of their low-water surface, near their mouths, which invariably produced bars.

It was suggested, that the treatment, of some special river should be submitted to the Institution, in order to afford an opportunity for a continuation of the discussion of this interesting topic.

After the meeting, Mr. Doull, jun., exhibited a model of, and described a system, proposed by Mr. James Forbes, for lowering and raising ship's boats, and also the construction of a Cylindrical Ship Life-Boat,

which latter, it was contended, approached nearer than any other construction, the qualities considered requisite for a boat of that class.

The Cylindrical Life-Boat was 30 feet long, 8 feet wide, and 2 feet deep, would carry with ease sixty persons, with provisions for a week, in the air-tight seats,—could not be upset, or swamped,—could not be pulled either end foremost,—was steered with an oar,—had extra buoyancy in water-tight compartments, and was so constructed, that a hole might be knocked into one, or more divisions, without danger to the whole,—was fully stowed with masts, sails, oars, and everything complete so as to be always ready for use, on any sudden emergency.

When folded up it was perfectly cylindrical, and on reaching the water opened out, and could in a minute be made a stiff boat; and the dimensions could be modified to suit any vessel.

The apparatus for lowering the boats consisted of two davits, with tubular stems, down which the ropes passed, through sockets in the bulwarks, to a drum on which they were coiled, so as to be easily wound up by a wheel and pinion, with the exercise of very little power, and in lowering, a friction-break could be used with great advantage. By this means the boat would swing out very easily, as the davits could turn entirely round, and it would be nearly impossible that a boat could be swamped, in the heaviest sea, or under circumstances of the greatest difficulty. The cylindrical form, and its lightness of construction, would enable a boat of this sort to be put over the bulwarks by six men, without tackle of any kind, and by merely cutting a lashing when in the water, it would fall open; when all the stores, &c., would be found made fast within, and ready for use.

The following paper was announced for reading at the Meeting of Tuesday, November 23rd., "On the Drainage of Towns." By Mr. R. Rawlinson, Assoc. Inst. C.E.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING NOVEMBER 18, 1852.

ALEXANDER PARKES, of Pembrey, Carmarthen, chemist. *For improvements in obtaining and separating certain metals.* Patent dated May 1, 1852.

The *first* process described by the patentee is applicable for the separation of gold from compounds of lead containing that metal. The gold ore or auriferous earth is first smelted with lead and the usual fluxes, and the compound resulting from this operation is melted with the addition of one per cent., or 22 lbs. 4 oz. of zinc to every ton thereof containing 10 oz. of gold. This proportion will be increased with that of the gold present. The zinc is added when the compound is in a melted state, and at about the melting temperature of zinc; and after stirring, so as to ensure the gold being all taken up, the mixture is allowed to cool, the zinc and gold in combination are removed, and the gold separated by removing the zinc by means of acid, or by distillation with carbon.

The *second* process is applicable to the separation of gold and silver from mixtures containing the same, and consists in employing for that purpose a metal or compound fusible at a lower temperature than the compound operated on. The process is somewhat similar to that of amalgamation, where mercury is employed, only that, as the patentee uses metals not naturally fluid, he is compelled to apply heat during the process to secure the necessary degree of fluidity. The metallic compounds treated are reduced to a fine powder, and mixed with from ten to thirty per cent. of lead or zinc, and five per cent. of chloride of ammonium, or chloride of zinc, or one per cent. of carbon (which may be used without the salts named). They are then placed in an iron barrel or other convenient vessel heated by a furnace, and set in motion for from five to ten hours, at the expiration of which time the amalgamation of the precious metals will have been effected. Then by washing or other means, the amalgamated mass is separated from the earthy particles, and treated by cupellation, or other means, in order to obtain the gold or silver in a metallic form.

WILLIAM WOOD, of Pontefract, York, carpet manufacturer. *For improvements in the manufacture of carpets and other fabrics, and in machinery or apparatus connected therewith.* Patent dated May 1, 1851.

Claims.—1. The application to looms for weaving piled fabrics of two wires, moved by the same instrument or carrier.

2. The application of weft-stopping motion to looms, where wires are fixed to carriers or instruments.

3. The application of weft-stopping motion to both sides of looms for weaving pile fabrics by wires.

4. The weaving of carpets or other fabrics with a pile on the underside of different materials from that which is employed for the face pile.

JOHN MOORE, of Arthur's Town, Wexford. *For improvements in nautical instruments applicable for ascertaining and indicating the true spherical course and distance*

between port and port. Patent dated May 1, 1852.

Mr. Moore's improved instrument is composed of two brass graduated circles, intersecting each other, and a third circle equatorial to the other two. The position of these circles is capable of being adjusted with reference to each other, and they are used in combination with a fourth circle, also graduated, which forms a great circle to the skeleton globe composed of the intersecting circles above mentioned. The modes of using the instrument vary with the nature of the particular problem requiring to be solved.

Claim.—The mode described of combining parts into instruments applicable to resolving nautical problems.

AUGUSTUS SIEBE, of Denmark-street, Soho, engineer. *For improvements in machinery for manufacturing paper.* (Being a communication.) Patent dated May 1, 1852.

1. The patentee describes an arrangement of sieve or strainer, for separating knots from the pulp, which is composed of a series of rings, with narrow interstices between them, combined into the form of a cylinder, and having fans or beaters of a star shape, or other suitable form, in the interior, by which the pulp admitted to the interior of the cylinder is driven out through the interstices between the rings, and thereby cleared from knots and other similar impurities. The beaters or fans have not a regular rotary motion, but are caused to be driven alternately in opposite directions; and this reciprocating motion is preferred. The form of the beaters may be indefinitely varied. and the rings may be polygonal or of other suitable shape.

2. For pressing and glazing paper, the patentee employs two travelling sheets of polished metal, working between pressure rollers. The paper, being laid on the upper travelling sheet, is carried forward under the action of the rollers, and thereby pressed or glazed, as the case may be.

Claims.—1. The construction of sieve or pulp strainer formed by rings, and the novel construction of fans described.

2. The employment of endless metal bands, between which paper may be passed under pressing rollers to be pressed or glazed.

RICHARD JORDAN GATLING, of New York, America. *For certain improvements in machinery for seeding grain.* Patent dated May 4, 1852.

For description of Mr. Gatling's machines, see *ante*, p. 381.

RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Co., of Fleet-street, patent-agent. *For improvements in paddle-wheels.* (A communication.) Patent dated May 4, 1852.

For specification of this invention, see the first article of our present Number.

PETER FAIRBAIRN, of Leeds, machinist, and PETER SWIRES HORSMAN, of Leeds, flax-spinner. *For certain improvements in the process of preparing flax and hemp for the purpose of heckling, and also machinery for heckling flax, hemp, china grass, and other vegetable fibrous substances.* Patent dated May 8, 1852.

Claims.—1. Taking flax and hemp, after scutching, and passing it in a wet state between pressing rollers, in order to bring the material into a suitable condition to be afterwards operated on by heckling machinery.

2. A means of effecting a progressive extension of the ascending and descending movements of the strick of flax, hemp, or other material in machinery for heckling or opening the fibre.

3. A mode of introducing the points of the heckles into the stricks, for the purpose of puncturing the material, and opening the fibres by short downward strokes, effected by the reciprocating action of the heckles.

4. A mode of throwing the strick of flax, or other fibrous material, on the heckle points, by a pendulous movement of the holders.

5. Giving to the strick of material under the heckling operation a reciprocating movement in an elliptical direction.

ALEXANDRE JULES SAILLANT, junior, of Rue Vivienne, Paris, tailor. *For certain improvements in the manufacture of articles of dress.* Patent dated May 8, 1852.

The improvements consist in inserting into certain parts of articles of dress, such as trousers, waistcoats, and coats, strips or bands of elastic material, by which a good fit of the garments is ensured, and they are retained in their proper positions without the aid of straps, braces, or other such contrivances. The elastic material also enables the garments to yield under strain or exertion of the wearer, and thus secures their durability.

Claims.—1. The superseding of straps, braces, laces, or other contrivances employed for retaining men's garments in a proper position.

2. The application to men's garments of an elastic tissue, for securing their shape without impeding the movements of the body.

WILLIAM ARMITAGE, of Manchester. *For an improved safety envelope, and certain improvements in the machinery to be used in the manufacture of the same.* Patent dated May 8, 1855.

The *first* of these improvements consists in manufacturing envelopes by stamping them from woven fabrics suitably glazed to allow of their being written on, and then folding over and guming the flaps in the manner practised when making envelopes of paper.

The *second* improvement consists in employing double woven fabrics, so that when cut up, envelopes may be produced therefrom in a complete state, and without the necessity for guming the flaps.

The *third* improvement consists of an arrangement of cutting machinery for cutting up double woven fabrics suitably produced for manufacturing envelopes.

Claims. — 1. Manufacturing envelopes solely of woven fabrics.

2. Manufacturing envelopes of double woven fabrics.

3. The machinery for cutting double woven fabrics.

JOHN CAMPBELL, of Bowfield, Renfrew. *For improvements in the manufacture and treatment or finishing of textile fabrics and materials, and in the machinery or apparatus used therein.* Patent dated May 8, 1852.

The improvements of Mr. Campbell consist,

1. In a peculiar combination of arrangements for producing on woven fabrics having the warp and weft threads crossing each other diagonally, what is termed the "elastic finish;' the essential feature of the improved machinery being the employment of conical drums or rollers in combination with stretching or breadthening bars, in order to obtain the necessary angling motion.

2. In an improved arrangement of stretching or breadthening bars, so adapted as to ensure the fabric under operation being stretched to its full width.

3. In a mode of improving the appearance and increasing the substance of certain classes of woven fabrics (such as cotton goods) by submitting them to an operation of straining, and then drying very slowly, so as to cause the expansion of the dressing used in the earlier stages of manufacture, and of which an increased quantity is employed, and thus swell the fibres of the threads composing the fabrics.

JOSEPH JEPSON ODDY TAYLOR, of Gracechurch-street, naval engineer. *For improvements in ships, boats, and vessels, and in certain articles of ships' furniture.* Patent dated May 8, 1852.

The "improvements in ships, boats, and vessels," consist in constructing the sides of the same of a series of air-tight tubes disposed longitudinally or otherwise, so as to ensure additional buoyancy; or in applying such tubes to the sides of ships, boats, and vessels already built.

The "improvements in certain articles of ships' furniture," consist in forming boxes, vases, or cases, with their sides, ends, and other portions composed of air-tight tubes, so as to ensure by their buoyancy the safety of mail-bags, letters, or parcels, which may be inclosed in the boxes, vases, or cases.

GEORGE ROBINS BOOTH, of the Wandsworth-road. *For improvements in themanufacture of gas.* Patent dated May 8, 1852.

Mr. Booths's improvements consist in manufacturing vegetable gas from seeds, leaves, fruit, and stems of plants instead of employing the oils, gums, or resins obtained therefrom in such process. Any seeds, or parts of plants, capable of yielding oils or gums from which gas may be produced, may be used in this manner, and the form of apparatus or retort employed may be very much varied; the patentee prefers, however, to project the oily seeds on to a highly heated surface, as being in practice an affectual mode of working and enabling the gas to be made in small quantities as required for use. A portion of oil will be found to be condensed in the pipes leading from the retort, which may be economically employed in the generation of gas.

GEORGE FREDERICK MUNTZ, jun., of Birmingham. *For improvements in the manufacture of metal tubes.* Patent dated May 8, 1852.

Mr. Muntz proposes to manufacture metal tubes by rolling a short thick tube flat so as to extend it to any desired length, and then opening out the flattened tube by passing it between grooved rolls. There will be a raised seam along each side of the tube thus manufactured, which is to be cut off before finally passing between the rolls. The metal which the patentee prefers to employ is such as may be rolled in a heated state, and a suitable metal for the purpose is that known as Muntz's Metal, which is composed of about 38 parts of zinc to 60 parts of copper. The tubes thus manufactured are suitable for constructing boilers and other purposes; and when they are required to be burnished on the exterior, this may be effected by drawing them through dies.

WILLIAM GILLESPIE, of Torbane Hill, Linlithgow, gentleman. *For an improved apparatus, instrument, or means for ascertaining or setting off the slope or level of drains, banks, inclines, or works of any description, whether natural or artificial, or under land or water.* Patent dated May 8, 1852.

This "improved instrument," which the patentee calls an "inclinometer," consists of an o long, parallel-sided frame of wood or metal, having attached by a hinge to one side, which will be the upper one when the

instrument is in use, a straight bar of rather greater length than the side, which bar is capable of being raised on its hinged end, so as to make any desired angle with the upper edge of the frame. Through the projecting part of the upper bar is passed a T-square, which has a plumb-line attached to it, and the edge of the square, which lies against the end of the frame, is graduated with a scale.

In taking the angle of any incline, the frame is placed so as to rest upon it, and the hinged bar is then raised until the plumb line hangs vertically, when it is clamped by a screw, and retained in that position. The scale on the edge of the T-square will then indicate the angle of the incline.

William Littell Tizard, of Aldgate, High-street, brewers' engineer. *For improvements in machinery, apparatus, and processes for the preparation of grain, and for its conversion into malt, saccharine, vinous, alcoholic, and acetous liquors.* Patent dated May 8, 1852.

The patentee describes and claims—

1. An arrangement of machinery for the preparation of grain, by threshing or separating it from the husk and straw.

2. A melting apparatus; an arrangement of water-heater, and an arrangement of machinery to be applied to ordinary malt-house floors.

3. Several improvements in a previously-patented mashing apparatus.

4. A mode of filtering vinous and saccharine liquors.

5. An improved mode of conducting the process of distillation.

6. A mode of manufacturing acetous liquors, such as vinegar and acetic acid.

Joseph Walker, jun., of Wolverhampton, merchant. *For certain improvements in vacuum pans for the evaporation and crystallization of saccharine or other solutions.* (A communication.) Patent dated May 25, 1852.

These improvements consist in introducing into the body of vacuum pans a series of vertical tubes into and through which steam is admitted and allowed to circulate in order to facilitate the operations of evaporation and crystallization. The tubes are enclosed within a cylindrical casing, between which and the sides of the pan a vacant space is left. This arrangement causes an upward current of the solution in the pan at the centre of the series of tubes, whilst a gentle descending current is produced between the cylinder and pan, by which combined, such a motion is induced in the contents of the pan as effectually prevents the burning thereof, and equalizes the heat throughout.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 2, 1852.

147. Edwin Whele. Improvements in apparatus for burning candles, and in horological apparatus attached thereto.

174. Alexander Campbell Duncan. Improvements in the art or process of dyeing cotton or other textile fabrics, or cotton or other yarns, when printed or mordanted with the colouring matter of madder or of dye woods, and in machinery or apparatus employed therein.

Dated October 19, 1852.

438. Joseph Harcourt, and William Harcourt. The application of porcelain, glass, or earthenware to articles in which, or for which, those materials have never heretofore been used.

Dated October 29, 1852.

467. John Smith. A machine for the cultivation or cleaning of land, and for digging potatoes or other roots.

471. John Provis. Improvements in the construction of ships or vessels.

474. William Weild. Improvements in looms for weaving certain descriptions of pile fabrics.

Dated October 23, 1852.

498. George Malcolm. Certain improvements in the process of carding or teasing jute and other fibrous substances.

Dated October 25, 1852.

511. John Hunter. Improvements in electric telegraphs, and in apparatus connected therewith.

519. Mathew Fitzpatrick. Certain improvements in machinery or apparatus to be applied to locomotive engines and carriages for the prevention of accidents, and also in the manufacture and application of indestructible and non-rebounding cushions, to be applied to the above and for other similar purposes.

Dated October 27, 1852.

531. George Evans. Improvements in treating peat and other carbonaceous matters.

532. John Lee Stephens. Improvements in furnaces.

533. Anthony Fothergill Bainbridge. Improvements in the manufacture of artificial flies and other bait for fish.

534. Samuel Clarke. Improvements in the manufacture of candles.

535. James Conry. Improvements in umbrellas and parasols.

536. James Crosby. Improvements in looms.

537. William Robert Bertolacci. An improved pneumatic ink and pen holder.

538. Alfred Charles Hervier. An improvement in the application of centrifugal force to propelling on water.

539. Louis Napoleon Le Gras, and William Lawrence Gilpin. A compound having the properties of gutta percha.

541. Thomas Wilks Lord. Improvements in safety and other lamps.

542 Henry Carr. Certain improvements in railways.

543. John Norton. Improvements in blasting.

544. James Hadden Young. Improvements in expressing juice or fluid from the sugar cane, and from other matters.

545. Charles Benjamin Normand. Improvements in machinery for sawing wood.

546. James Nasmyth. Improvements in the mode of obtaining and applying motive power.

547. James Henry Smith. Improvements in corsets.

Dated October 28, 852.

548. William Thorp. Certain improvements in steam boxes, and the mode of heating press plates used in hot-pressing of silks, de laines, cobourgs, merinos, fancy goods, and other similar fabrics.

549. Bryan Donkin, the younger, and Barnard William Farey. Improvements in the machinery for measuring or marking off long lengths or continuous webs of paper or other materials into any required lengths, for the purpose of being cut or otherwise disposed of.

550. John Wormald. Improvements in machinery or apparatus for roving, spinning, and doubling cotton, wool, or other fibrous substances.

551. Henry Provost. An improved hat protector.

552. George Hattersley. A radiating hearth-plate.

553. Charles Frederick Bielefield. Improvements in billiard and bagatelle tables.

554. John Collis Browne. An invention of the relief of individuals suffering from pulmonary affections or diseases of the chest.

555. Thomas Parker Tabberer. Improvements in machinery for frame-work knitting.

556. Charles Arthur Redd. Improvements in telegraphing or communicating signals at sea and otherwise.

557. Robert Mallett. Improvements in fire-proof and other buildings and structures.

Dated October 29, 1852.

558. Henry Robert Ramsbotham, and William Brown. Improvements in preparing and combing wool and other fibrous substances.

559. Charles Auguste Joubert, and Léon Jacques Tricas, and Julius César Kohler. Improved busks for stays.

560. Arthur Ashpital, and John Whichcord, the younger. Certain improvements in cocks, valves, and fire-plugs.

561. James Godfrey Wilson. Improvements in signals to be used on railways, or for similar purposes, and in the apparatus connected therewith.

562. Arnold James Cooley. Improvements in woven and felted fabrics, to render the same repellent to water and damp.

563. George Bower. Improvements in gas stoves or fire-places.

564. William Bates. Improvements in apparatus for getting-up stockings and other hosiery goods.

565. William Henry Fox Talbot. Improvements in the art of engraving.

566. Louis Napoleon Le Gras, and William Lawrence Gilpin. Improvements in transmitting electric currents.

567. Richard Archibald Brooman. Improvements in violins and other similar stringed musical instruments.

568. Richard Archibald Brooman. Improvements in tackle blocks.

Dated October 30, 1852.

569. William Binns. An improved mode of constructing a draught breast-plate or collar for horses or other draught animals.

570. Martin Watts. Certain improvements in machinery or apparatus for roving or preparing cotton and other fibrous substances for spinning.

573. Edward Bird, and Edward Welch. An improved cart or vehicle.

574. John Gedge. Improvements in printing presses or machines.

575. Pierre Bernardet de Lucenay. The production of photographic images by means of artificial light.

576. Bowman Fleming McCallum. An yarn drying machine.

577. John Crowther, and William Teale. Improvements in obtaining motive power.

578. Edmund Adolphus Kirby. An improved adjusting couch for medical, surgical, and general purposes.

579. Alfred Vincent Newton. Improvements in machinery for cutting corn and other standing crops.

580. Jean Auguste Lebrun. Improvements in the construction of buildings and pavements, and the manufacture of the materials used therein.

581. Julian Bernard. Improvements in the manufacture of glass.

582. James Sinclair. Improvements in engines to be worked by steam, air, or water, the said improvements being also applicable to pumps.

583. Richard Archibald Brooman. Improvements in revolving fire-arms.

584. George Thomas Selby. Improvements in steam boilers.

586. George Thomas Selby. Improvements in machinery for the manufacture of tubes and pipes.

588. George Fergusson Wilson, and Edward Partridge. Improvements in the instruments or apparatus used when burning candles.

589. William Dantec. Improvements in preventing incrustation in steam boilers.

Dated November 1, 1852.

590. William Petrie. Improvements in the manufacture of sulphuric acid.

591. George Evans. An improved gridiron.

592. George Dixon. An improvement in bleaching palm oil.

593. Edward Lawson. Certain improvements in machinery for preparing to be spun, hemp, flax, tow, wool, silk, cotton, and other fibrous materials.

594. Charles John Berkeley. A new or improved reflector, or new or improved reflectors, for illuminating purposes.

595. Joseph John William Watson, and Thomas Slater. Improvements in galvanic batteries, and in the application of electric currents to the production of electrical illumination and of heat, and in the production of chemical products by the aforesaid improvements in galvanic batteries.

596. Joseph Dunning. An improvement in the construction of coke ovens.

597. Henry Walker. Improvements in machinery and apparatus used in cylinder printing.

598. Henry Brock Billows. Improvements in the construction of gas burners for illuminating and heating purposes.

599. Julius Smith. Certain improvements in apparatus to be used in ships and steamers for ascertaining and signalling depths at sea.

600. George Fergusson Wilson. Improvements in the manufacture and treatment of oils.

601. Julius Jeffreys. Improvements in obtaining power when steam or other vapour is used.

602. John Chubb. Improvements in locks.

603. David Thompson. Improvements in the manufacture of carpets.

604. Paul Jerrard. Certain improvements in ornamenting japanned and papier maché surfaces, as also the surfaces of varnished and polished woods.

605. George Stenson. Improvements in apparatus for separating gold from auriferous sand and earth.

606. John Jacques, the younger. Improvements in chess and draught boards.

607. Francis Daniell. Improvements in stamp heads.

Dated November 2, 1852.

608. Jerome André Drieu. Improvements in machinery for weaving and for dividing double cloth to make pile fabrics.

609. John Nicholas Marion. A new mode of rendering concrete coleseed oil.

610. William Edward Newton. Improvements in the manufacture of capsules or covers for bottles and other hollow articles.

611. Robert William Sievier. Improvements applicable to the manufacture of hats, caps, and bonnets, or other coverings for the head.

612. James Dible. Improvements in ventilating and heating ships, which improvements are also applicable to extinguishing fire on board ship.

613. Gerge Hyacinthe Ozouf. Certain improvements in working, forming, or shaping sheet metal and alloys.

614. Charles Dickson Archibald. Improvements in machinery and apparatus for crushing, grinding and triturating refractory and other materials, and for washing and separating ores and metals from earthy and other substances.

615. Charles Dickson Archibald. Improvements in lighting and heating.

616. Louis Auguste Pouget. Improvements in lamps.

617. John Macintosh. Improvements in the manufacture of paper.

619. George Fergusson Wilson. Improvements in the preparation of metals for, and in the manufacture of, candles and night lights.

620. George Fergusson Wilson. Improvements in treating wool in the manufacture of woollen and other fabrics.

621. Bernhard Samuelson. Improvements in breaking up and tilling land.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," Nov.* 16, 1852.)

71. John Ambrose Coffey. Improvements in apparatus for performing various chemical and pharmaceutical operations, hereby denominated "Coffey's Improved Patent Esculapian Apparatus," parts whereof are applicable to steam boilers, steam and liquid gauges, stills, and syphons.

84. Edwin Pettitt. Improvements in the manufacture of ammoniacal salts and manures.

95. William Oxley. Improvements in apparatus for heating and drying.

101. Thomas Allan. Improvements in the application of carbonic acid gas to motive purposes.

106. Thomas Allan. Improvements in propelling.

174. Alexander Campbell Duncan. Improvements in the art or process of dyeing cotton, or other textile fabrics, or cotton or other yarns, when printed or mordanted with the colouring matter of madder or of dyewoods, and in machinery or apparatus employed therein.

198. Edwin Bates. An invention for retarding and effectually stopping at discretion railway carriages, and also for carriages of all descriptions, for the more safely descending inclined planes, either in the streets, or on turnpike roads, to be called "Bates's Break."

230. James Bullough, David Whittaker, and John Walmesley. Improvements in sizing machines.

283. Edwin Pettitt, and James Forsyth. Improvements in spinning and drawing cotton and other fibrous substances, and in machinery for that purpose.

300. Professor Andrew Crestadoro. Certain improvements in impulsoria or machinery for applying animal power to railways, waterways, and common roads, and to other mechanical purposes, part of which improvements relate to railways and other carriages, to buffers, springs, breaks, and chains, and in the propelling vessels across liquid elements.

309. James Yule. An improved arrangement of sawing machinery.

330. Henry Moorhouse. Improvements in machinery or apparatus for cleaning woollen, cotton, or linen rags and waste, which machinery or apparatus is applicable to cleaning and tempering clay, or other similar purposes.

354. Joseph Walker. Improvements in machinery for crushing and bruising malt, grain, and seeds.

360. George Lloyd. An improvement or improvements in the manufacture of paper.

365. Edward Lloyd. Certain improvements in steam engines, the whole or part of which improvements are applicable to other motive engines.

403. Jeremiah Driver, and John Wells. Improvements in moulding in sand and loam for the casting of iron and other metals.

404. William Stevenson. Improvements in weft forks for power looms.

453. Frederick Richard Robinson. An improvement in the gridiron or instrument for cooking steak or other articles by broiling.

463. William Harrison. Certain improvements in machinery or apparatus for sizing and otherwise preparing cotton, wool, flax, and other warps for weaving.

487. Archibald Slate. Certain improvements in the manufacture and construction of cores, and core bars, used in the production of hollow castings in iron and other metals.

509. Charles Watson. Improvements in ventilation.

515. Robert William Mitcheson. Improvements in anchors.

523. William Clarke. Improvements in joints for connecting metals.

525. Myer Myers, and Maurice Myers, and William Hill. Certain improvements in pens and penholders.

528. Halsey Draper Walcott. A new and useful or improved mechanism or contrivance for cutting button holes or slits in cloth or other materials.

529. Robert William Mitcheson. An improved safety hook.

532. John Lee Stevens. Improvements in furnaces.

533. Anthony Fothergill Bainbridge. Improvements in the manufacture of artificial flies and other bait for fish.

534. Samuel Clarke. Improvements in the manufacture of candles.

535. James Conry. Improvements in umbrellas and parasols.

540. Thomas Potts. Improvements in the manufacture of hinges, and in the machinery for producing the same.

544. James Hadden Young. Improvements in expressing juice or fluid from the sugar cane, and from other matters.

550. John Wormald. Improvements in machinery or apparatus for roving, spinning, and doubling cotton, wool, and other fibrous substances.

554. John Collis Browne. An invention for the relief of individuals suffering from pulmonary affections or diseases of the chest.

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556. Charles Arthur Redl. Improvements in telegraphing or communicating signals at sea and otherwise.

557. Robert Mallet. Improvements in fire-proof and other buildings and structures.

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619. George Fergusson Wilson. Improvements in the preparation of materials for and in the manufacture of candles and night lights.

620. George Fergusson Wilson. Improvements in treating wool in the manufacture of woollen and other fabrics.

621. Bernhard Samuelson. Improvements in breaking up and tilling land.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

George William Ley, for a method of imitating carvings in wood. November 3.

Marc Klotz, for an improved process or apparatus to be employed in ornamenting fabrics, leather, paper and other surfaces. November 4.

William Thomas Henley, for certain improvements in electric telegraphs, and in apparatus and instruments connected therewith. November 9.

WEEKLY LIST OF NEW ENGLISH PATENTS.

William Petrie, of Woolwich, Kent, civil engineer, for improvements in obtaining and applying electric currents, and in the apparatus employed therein; part or parts of which improvements are applicable to the refining of certain metals, and to the production of metallic solutions, and of certain acids. November 13; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Nov. 11	3386	Dobson and Barlow ...	Bolton-le-Moors	Upper part of a weight hook for lapping machines.
12	3387	George Hyde	Fleet-street	Portable writing case.
16	3388	D. and E. Bailey	High Holborn	Smoke-guard.
,,	3389	B. Cogswell............	Strand	Six-shot rifle-pistol.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

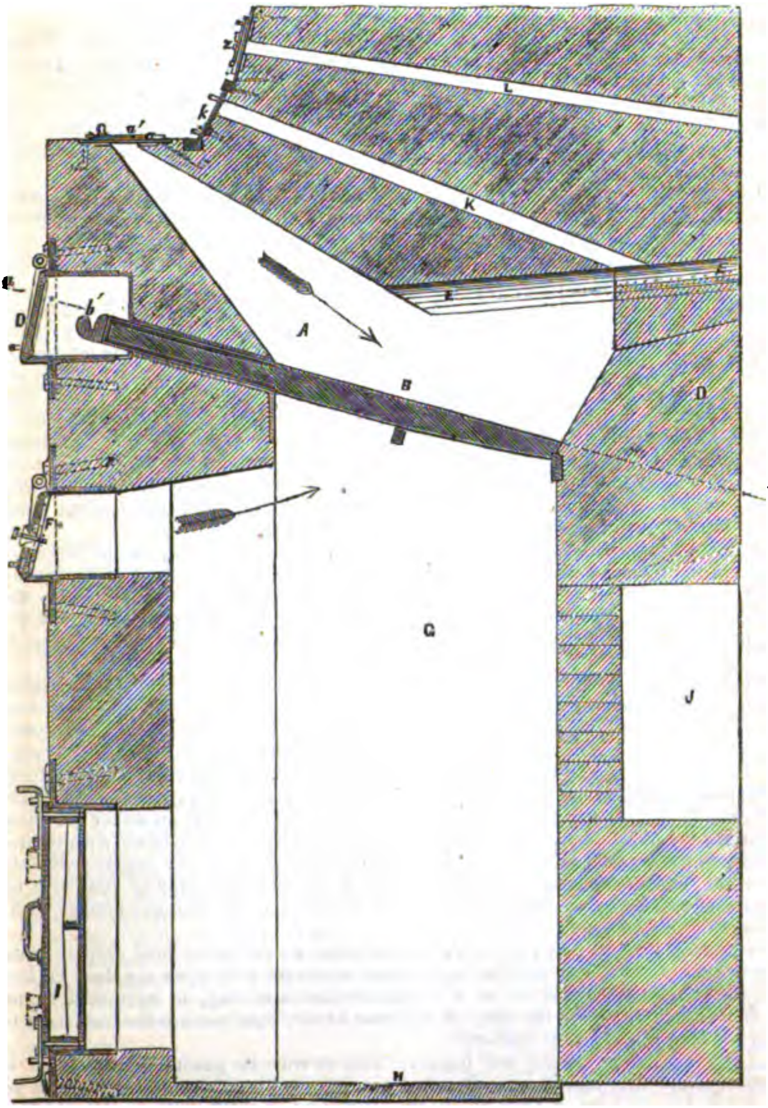
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1529.] SATURDAY, NOVEMBER 27, 1852. [Price 3*d*., Stamped 4*d*.

Edited by R. A. Brooman, 166, Fleet-street.

STIERBA'S IMPROVED FURNACES.

Fig. 1.



STIERBA'S IMPROVED FURNACES.

(Patent dated May 22, 1852. Specification enrolled November 22, 1852.—See *post* p. 436.)

MR. STIERBA's patent embraces two principal objects—first, the production, where necessary, of a body of flame of considerable length, and of an intense heat, without the aid of a blast; and secondly, the promotion of a rigid economy, by consuming perfectly the gaseous products of combustion. The specification describes the mode in which these objects are accomplished in the furnaces—pointing out how the fuel is supplied, and how the admission of air is regulated in divided streams.

Fig. 1 is a sectional elevation of the apparatus. A A is an open space, of the peculiar form and construction shown; it forms a hopper or shoot for the gradual feeding of fuel to the fire. This construction of hopper for feeding fuel is based on the following principle:—Suppose a hollow pyramid without a bottom, and of the form shown in fig. 2, were placed on a slanting surface and filled with coal, then, on raising one side of the pyramid, the coals would roll away on the slanting surface, as shown.

a^1 is a door, by means of which the hopper A A may be wholly or partially closed when requisite; B B are the furnace bars, which are inclined as shown in the figure. Each bar terminates in a separate handle b^1, by means of which, through the door D, it may be shifted or withdrawn as required, or, when desired to remove, the slag or pieces of cinder which may be too large to fall through the bars.

The thickness of the bars, and their distance apart from one another will, of course, depend upon the size of the apparatus. D is the fire-bridge. The fire-place is cut away in a slanting direction at E E, so as to slope upwards from the bottom of the hopper A A to above the fire-bridge, as shown in fig. 1, thereby forming an open space leading from the hopper A A to the fire-bridge, and regulating the admission of air at the outer end of the hopper A A. F is a door, furnished with a valve *e*, leading into a space G, below the sloping bars for regulating the admission of air to the fuel from under the bars B B. H is the ash-pit, into which the ashes and smaller cinders drop; I is a door to the ash-pit, for removing the accumulated ashes and cylinders. J is a man-hole. K is one of several passages leading from the outer air into and immediately over the centre of the fire-bridge.

The air passages may be wholly or partially closed by valves *k*, one of which is shown in the figure, so as to enable the stoker either to regulate or stop the supply of air to this part of the furnace. L is one of three or more passages for the admission of cold air, which need only be made use of when required to check the fire, or cool the furnace suddenly. The valves Z are for closing these passages when not in use.

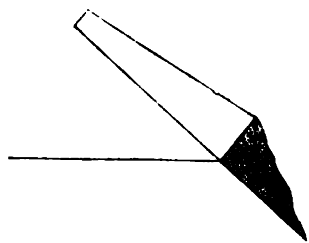
The mouth of the hopper, AA, is made small in order to prevent the admission of too much cold air through it, and also to prevent very large lumps of coal or fuel being introduced. When it is required to make a fire in the furnace, a small quantity of "live coal" is thrown into the hopper AA, intermixed with pieces of crumbled fuel *not* alight, and the whole of the hopper, AA, is then filled up with fuel, which should be previously crumbled to allow of its passing freely into the hopper. The draft of air passing from the open space G, into the fuel from under the bars, will drive the flame from the live coals amongst the fuel in contact with it, and thereby ignite it; and as the fuel is gradually consumed, a further supply will slide down the hopper towards the fire; so that a continuous supply of fuel may be maintained as long as needful, and the stoker has only to see that the hopper, AA, is kept full of fuel.

By looking through any one of the air-passages K, the stoker may observe from time to time, the state of the fire, and, when necessary may open the door D, and shift the bars of the grate B; or if the accumulation of slag, or large cinders, on the bars should intercept the draft of air from below, may remove the bars so as to allow the slag to fall into the ash-pit.

As the fuel slides down the hopper, AA, it will be gradually heated as it approaches the fire, and the supply of air at the mouth of the hopper must be so regulated that the current shall not be strong enough to prevent the fuel being thus heated as it approaches the fire. The gentle current of air which passes down

through the fuel in the hopper AA, will carry the smoke and gaseous products proceeding from the fuel into the fire, where they will be ignited, and with the aid of the currents of air supplied to the furnace, they will be more or less perfectly burnt, according to the care taken in regulating the currents of air.

Fig. 2.



The currents of air passing through the mouth of the hopper AA, the open space G and the air-passages KK, may be so regulated as to drive from the fire a body of flame of considerable length and intense heat, and which may be made to pass under a boiler, or to return and pass through it in one or more tubes. The flame thus obtained may, if required, be driven into a chamber or reverberatory furnace, or it may be carried away by means of flues or pipes for heating purposes.

SOCIETY OF ARTS.—99TH SESSION, 1852-53: LIST OF PREMIUMS.

The Council of the Society of Arts have determined upon the following list of premiums to be competed for in the 99th Session of their Society, which has just commenced. It will be observed, that the subdivisions of the list are identical with those adopted at the Great Exhibition: and that the Society has, as usual, directed its well-informed patronage of the Arts, manufactures, and commerce, into the most useful channels, with a view to supply wants which have been seriously felt, or are likely to be created by the ever-changing aspect of trade. For this ample and enlightened encouragement of inventions, the public of this country, and indeed the world at large, must ever remain deeply indebted to this most useful of our learned bodies.

Classes I. to IV.—Raw Materials.

1. For the best essay on Salt: the sources from whence it is obtained, and the processes involved in its manufacture.—Great improvements have taken place in the process of evaporation.

2. For the best essay on Iron Ore, and the Manufacture of Iron as carried on in different districts and counties; especially contrasting the Iron Manufacture of England with that of America and the Continent of Europe.

3. For a cheap and efficient mode of extracting the metal from the Iron Sand (Teranaka) of New Zealand.—(This sand is extremely abundant, but hitherto the smelting has not been carried on economically.)

4. For the invention of any White Metallic Alloy, free from microscopic faults, which may be successfully applied to the Arts, is hard enough for use in reflecting telescopes, and is not liable to be acted upon by the atmosphere.

5. For the discovery in England, or the importation from any of the British Possessions, of Plumbago, or of some other substance which may be used in lieu thereof, equal in quality to that now obtained from Cumberland.—(The Cumberland mines are now nearly exhausted.)

6. For the discovery of a New Fuel, which shall occupy less space, and be of less weight than any now in use, without diminution in the amount of heating-power, or liability to injure metals in contact with it.—(For steam navigation this would be of great importance as economizing space and reducing weight.)

7. For an account of the processes involved in the preparation of Charcoal, and its recent applications to manufacturing and other purposes.

8. For the best essay on the Chemical Composition of Rocks—the changes which they have undergone, and are now undergoing; especially in relation to those which are used for building and other similar purposes.

9. For the best essay on the Nature, Composition, Properties, Geological Distribution, and working of Flag, Slate, and other Stones used for paving.

10. For the best essay on the Nature and Properties of Granite; on the relative qualities of the material obtained from quarries in England, Scotland, Ireland, and the Channel Islands; and their comparative

fitness for Architectural and Engineering purposes.

11. For an account of a new method of making Sulphuric Acid, which shall be equally efficient with that at present employed, and which shall not require the large leaden chambers now in use.

12. For an account of the manufacture of pure Hydrochloric Acid, free from all metallic impurities.

13. For the production of a bright Blue Colour, applicable to the manufacture of Papier Maché, and not liable to be affected by the atmosphere.—(No good colour for this purpose is at present known.)

14. For an account of the manufacture of pure Potash and Soda, free from earthy impurities, as re-agents for the use of Chemists.

15. For an account of the economic manufacture of the Oxide of Zinc, and its incorporation with other colours, so as to render them not liable to be acted upon by sulphureous gases, or to fade on exposure to the light and heat.

16. For the importation of not less than half a ton of well-dried Plantains, or Bananas from the West Indies.—(The Great Exhibition bought to light samples of these fruits which had been in the Government stores for many years, but which are not yet imported for sale.)

17. For the importation from any British Possession, of not less than one hundred pounds of Dried Fruits, of equal quality with those now imported from the Mediterranean.

18. For the importation of not less than one pipe of Wine, of good marketable quality, made from the produce of Vineyards in Australasia.—(Good wines have been imported in small quantities.)

19. For the best essay on the theory and practice of Fermentation, particularly as applied to the Art of Brewing; so as to modify, or altogether dispense with the intermediate process of malting.

20. For an account of the processes employed in the manufacture of Starch,—the sources from whence it is obtained, and the purposes to which it is applied.

21. For a method of preparing an Engine Size for the use of Paper-makers, superior to any now in use.

22. For the importation of any New Substances which can be successfully used as a substitute for Caoutchouc.

23. For the importation from China, India, or elsewhere, of any new plants, or Trees producing Oils, or Fatty Substances, which can be used as food, or are applicable to manufacturing purposes.

24. For the importation of not less than ten gallons of Olive Oil, the produce of Australasia, or any other British Possession.

25. For the production of Oil and other substances from the Cotton-seed, and the application of the refuse material to agricultural, or manufacturing purposes.—(This seed is at present a refuse material, but produces a good oil if crushed.)

26. For a method of refining Vegetable Oils, by a quick and cheap process, so as to render them fit for burning in lamps, and for lubricating machinery.

27. For any new Unguent suitable for lubricating machinery; with account of the substances at present employed for that purpose, and from whence derived.

28. For improvements in the manipulation of Bees-wax, so as to render it applicable to new purposes in art or manufacture.

29. For a cheap and efficient means of extracting Dyes from Dye woods and other substances.

30. For the importation of not less than one ton of the root of the Galium Tinctorium from Canada.

31. For an account of improvements in Dyeing Turkey Red, by which the time required to produce a fast and brilliant colour may be reduced.—(At present a very tedious and dirty process.)

32. For the best samples of Cotton from the South African Colonies.

33. For the best samples of Cotton from the Western Coast of Africa.

34. For the most succesful Cultivation of Flax, in British India, or Australasia.

35. For an essay on the Flax Plants of India; the purposes to which they are at present applied, and the best means of employing the refuse material.

36. For the importation of at least two tons of any Vegetable Fibre, applicable to all the purposes for which Hemp is now used, and equally cheap, strong, and durable.

37. For the best sample of any new Ornamental Wood, suitable for the manufacture of Furniture.—(Many woods were exhibited at Hyde Park.)

38. For the introduction of a cheap and efficient substitute for Alpaca wool.

39. For the importation from any British Possession, of not less than one hundred pounds of Silk proper for manufactures.

40. For the importation from the East Indies, of Silk equal in quality to the best Italian, or China Silk.

Classes V. to X.—Machinery.

41. For an account of the most recent improvements in Marine Engines, having

for their object the reduction of the weight, and the increase of speed.

42. For the best means of increasing the draught through the Furnaces of Marine Boilers.

43. For the adaptation of a new submerged Propelling Power in Marine Navigation, which shall possess all the advantages of the screw propeller, and be more immediately acted upon by the moving power.

44. For improvements in Railway Buffers, Draw Links, and means of Coupling, especially applicable to merchandize and other wagons.

45. For an account of the mechanical means at present in use to facilitate the operation of Packing Goods, &c., whether by hydraulic presses or otherwise.—(A good portable press much wanted for the colonies.)

46. For a *resumé* of recent improvements tending to shorten the processes and facilitate the production of different manufactures:—

1st. In reference to Textile Fabrics.

2nd. In reference to Fictile Materials.

3rd. New Mechanical Appliances.

47. For an account of recent American Inventions, having for their object the substitution of mechanical processes for manual labour in the household and domestic arts.

48. For the most economic method of Ginning Cotton, so as to obtain the longest and cleanest fibre.—(An old, but also a present want.)

49. For improvements in Machinery for Printing Calico and other fabrics, by which ten, or more different colours may be worked simultaneously, and with accurate register.

50. For an account of recent improvements in machinery for breaking, cutting, and dressing Flax.

51. For an account of improvements in Machinery and processes for converting spun and other yarn into Rope, Twine, &c.

52. For an account of the methods now in use for working Malleable Iron; and of any recent improvements in the machinery employed for converting iron into bars, plates, &c.

53. For the construction of Moulds without seams, or joints for Metal Casting, in the round or in relief.—(Not yet done by manufacturers, but possible.)

54. For the production of Castings in Iron, equal in sharpness and in delicacy of surface to those now imported from Berlin.

55. For a cheaper mode than any at present practised of working Mouldings and other Architectural features in Granite or other stones.

56. For the best, simplest, and most economic Flour Mill for the use of Emigrants and Settlers.

57. For the best account of the methods at present employed in France and England for Grinding, Dressing, and otherwise preparing Flour.

58. For improvements in the Machinery and processes connected with the production of Coffee—for treating the pulpy fruit, and for curing the beans.

59. For an account of recent improvements in the Machinery and processes employed in the manufacture and preparation of Sugar from the Sugar-cane, and its comparison with Beet-root Sugar.

60. For the best account of recent improvements in the Construction and laying out of large Breweries, and the "Plant" connected therewith.

61. For a simple and inexpensive Apparatus for Brewing Beer, suitable for the use of Cottagers or Emigrants.

62. For the best essay on the means by which the Roofs and Walls of large Buildings may be constructed so as to avoid interference, by echoes or sounds, with the utterance of a voice, and to render such audible to the largest number of persons; with especial reference to the building of lecture and meeting rooms.

63. For the best essay on the Construction of Fire-proof Buildings.

64. For the best essay on the Construction of Common Roads.

65. For an account, accompanied by a series of drawings, of the Construction of Saloon Steamers on American Rivers; and the adaptation of the principle to European River and Ocean Navigation.

66. For the most economic means of obtaining and maintaining a Vacuum, and the purposes to which it may be applied.

67. For an essay on the Scientific Principles evolved in the application of the Stereoscope.—(These are little understood.)

68. For improvements in the Oxy-Hydrogen Microscope, and the method of illuminating it, by which a bright object may be presented on a dark ground.

69. For a cheap, convenient, and portable Camera, with stand and materials complete, for taking Calotype views.

70. For the most sensitive portable means of taking negatives for Calotypes.

71. For the best means of bringing a distant object within range of a camera, when beyond its focus.

72. For an essay on recent discoveries in the production of Photographic and Talbotype Images, especially in the taking of material objects by means of the Microscope; with Illustrations.—(This art is growing rapidly at the present time.)

73. For a good and cheap method of making Glass Balance Springs, suitable for Marine Chronometers.

Classes XI. to XXIX.—Manufactures. Textile Fabrics.

74. For an account of the methods at present employed in the manufacture of Paper for the various purposes of art and commerce, especially such as may be used for Printing, Talbotype, and Water-marking.

75. For a method of more thoroughly Sizing Machine-made Papers with Animal Size.

76. For an essay on the application of Indigo in the Printing of Calico, with special reference to new processes.

77. For improvements in Surface Printing Washing Fabrics, by which body colours may be employed without liability of removal by the action of fluids.—(Articles of this class are manufactured in India.)

78. For an account of improvements in the methods of producing Ornamental Designs on Silks, Satins, and Damasks: the designs to be of greater length, and obtained at less cost than by the Jacquard Loom.—(A new process has just been introduced in France.)

79. For an improved method of Bleaching Linen safely and rapidly, and without the necessity of any after exposure "on the green."

80. For an account of recent improvements in the manufacture of Carpeting by steam power, whether Brussels, velvet-piled or Terry; especially of processes by which the warp threads are coloured to form the pattern before weaving. Also for the application of new materials in the manufacture, uniting durability, economy, and elegance of design.

81. For improvements in the Manufacture of Embroidery by machinery, so that the production may more closely resemble that now made by hand.

82. For any improvement in the make, form, or material of Hats.

Metallic, Vitreous, and Ceramic Manufactures.

83. For the invention of a good and cheap Lock, combining strength and great security from fraudulent attempts, cheapness, freedom from disarrangement by dirt, and requiring only a small key.

84. For the best essay on Ancient Goldsmiths' Work.

85. For an essay on the combination of Engraving and Chasing, in connection with Electro - Metallurgy, as applied to Art-manufactures.

86. For any material improvement in the manufacture of Crown Glass, with special reference to transparency and durability of surface.—(Great room for improving the quality and durability of glass, as much that is now made, when exposed to the air, decomposes.)

87. For the discovery of any mode for increasing the depth, brilliancy, and durability of the colours used in Painting on Glass, either by an improved process in vitrifying, or by any other means.

88. For the discovery of a cheap and effectual method of Uniting Pieces of Coloured Glass, so as to supersede the use of lead joints, or other unsightly modes of joining, in the construction of Stained Glass Windows.

89. For a cheap and simple method of Casting Glass Pipes for Draining, and other similar purposes.

90. For the best account of the causes of the defects in Flint Glass, with the means which have been employed to remedy the same, accompanied by suggestions for the improvement of the manufacture.

91. For a method of producing large pieces of glass, free from veins, perfectly homogeneous, and suitable for Optical Purposes.

92. For an Achromatic Lens not less than three feet focus, capable of being used as quickly as smaller lenses, and suitable for Photographic purposes.

93. For an important improvement in the construction of Kilns for Firing, or Baking Parian, China, and Earthenware.

94. For an account of improvements in the material and processes for Glazing Earthenware and China.

Miscellaneous Manufactures.

95. For an essay on Architectural and Decorative Ornaments; the materials employed, their mode of manufacture, and the comparative cost of production.

96. For an essay on the best examples of Modern Furniture in various materials, exhibiting sound principles of construction, in combination with decorative art.

97. For a means of "patching the sieve" used by Block Paper Stainers, without manual labour.

98. For an account of improvements in Printing Paper Hangings by machinery, by which solid ground, or other colours may be laid, and the objections at present existing to the use of size may be overcome.

99. For the invention of an Artificial Stone, or Terra Cotta, free from the objections to which all such substances are now liable.

100. For an account of any material improvement in the Moulding, Burning, or general Manufacture of Bricks; the chief qualities required being strength, indestructibility, and cheapness.

101. For an account of improved modes of treating and applying Gutta Percha, so as to render it less liable to be acted upon by changes of temperature.—(Some curious results have recently been obtained.)

102. For the best account of the most recent applications of new materials and processes in the Manufacture of Soap.

103. For the invention of a good and cheap Candle for the use of Miners; to have a high melting point, and not be liable to waste or gutter.—(Much to be desired.)

104. For the invention of a good and cheap Bedroom Candle, requiring no snuffing, and not liable to gutter, or drip, when carried about.

105. For the best account and collection of specimens of the various materials and processes employed in the production of Artificial Flowers.

Class XXX.—Fine Arts.

This class of subjects is not provided for by any existing institution.

106. For the best series of four Outline Drawings in illustration of the Approach of Night, as described in Petrarch's third Ode.

107. For the best series of four Botanical and Structural Drawings of a Forest Tree.

108. For the best series of four Botanical and Structural Drawings of one of the Cerealia.

109. For the best series of four coloured Botanical and Structural Drawings of any well-known English Plant.

110. For the best series of four Drawings of any Animal, displaying its anatomy.

111. For the best series of four large Drawings, or Diagrams, suitable for Lecturers, in illustration of any special branch of Natural History, as the Hemp or the Flax Plant, the Silkworm, the Cochineal Insect, &c.; each drawing to be not less than three feet by four feet.

112. For the best series of four large Drawings, or Diagrams, suitable for Lecturers, in illustration of any piece of Machinery, as a Loom, Steam-press, Paper-engine, &c.; each drawing to be not less than three feet by four feet.

Swiney Prize.

In pursuance of the Will of the late Dr. Swiney, a prize of 100*l.* sterling, contained in a goblet of the same value, will be awarded by the Council of the Society of Arts, to the author of the

"Best published Work on Jurisprudence,"

which shall have appeared before January, 1854. Attention is particularly directed to that branch of Jurisprudence which specially relates to Art and Manufactures.

Special Prize.

The Society's Medal and a Premium of 50*l.* is offered for the best, and a Premium of 25*l.* for the second best Essay on the History and Management of Literary, Scientific, and Mechanics' Institutions; and especially how far, and in what manner, they may be developed and combined, so as to promote the moral well-being and industry of the country.

The Society of Arts will expect the Authors to publish the selected Essays under the sanction of the Society.

Notice.

The Society in all cases expressly reserves the power of rewarding each communication in proportion to its merits, or even of withholding the Premium altogether. In every case, however, Candidates may be assured that their claims will be judged with the utmost liberality.

All communications must be written on foolscap paper, on one side only, with an inch and a quarter margin. They should be accompanied by such drawings, models, or specimens as may be necessary to illustrate the subject. The drawings should be on a sufficiently large scale, to be seen from a distance when suspended on the walls of the meeting-room.

In regard to Colonial Produce of all kinds, it is absolutely necessary that a certificate from the Governor, or other qualified person, should accompany the samples sent to the Society, certifying that they really are the produce of the particular district referred to. The samples should be sufficient in quantity to enable experiments to made, and an opinion to be formed of their quality. Cotton should be sent both in seed and picked. Flax should be accompanied by a description of the culture, the nature of the soil, the weight of the produce per acre, and the extent to which it is cultivated in the particular district. Silk, by a description of the method by which the silkworms were managed; of the kind of trees, or plants on which they were fed, and particulars respecting the culture of such trees and plants. Wine, by an accurate description of the vineyards from whence produced. In every instance the maximum extent of the plantation from which the produce has been taken must be stated; with the average yield obtained, and whether similar articles have hitherto been exported from the Colony, or not, and in what quantities.

All communications and articles intended for competition must be delivered to the Secretary, at the Society's house, free of expense, on or before the 31st of March, 1853. This restriction, as to the date of receipt, does not apply to articles of Colonial produce. Any communication, or paper read at an Ordinary Meeting, will be considered as the property of the Society, unless any previous arrangement has been made to the contrary. But should the Council delay its publication beyond twelve months after the date of reading, the Author will be permitted to take a copy of the same, and to publish it in any way he thinks fit.

Successful candidates will be communicated with on, or before, the 8th of June, 1853. Unrewarded communications and articles must be applied for at the close of the Session, between the 8th of June and the 6th of July, 1853, after which date the Society will no longer be responsible for their return.

EDWARD SOLLY,
Secretary.

Society of Arts, John-street, Adelphi,
London, Nov. 1, 1852.

STATE AID TO THE ARTS OF DESIGN.

The Board of Trade have communicated to the officers of the Department of Practical Art, Marlborough House, the following decision which they have come to with reference to the terms and conditions on which they will be ready to apply money from the Parliamentary grants at their disposal in aid of the study of design, by supplying examples of high art:

"The Lords of the Committee of Privy Council for Trade having had under their consideration several applications from the managers and masters of National and other Public Schools for grants to be made to them of Drawing Copies, and examples used by the Department of Practical Art, in teaching Elementary Drawing, think it necessary to adopt some general principle which shall regulate the decisions of the Board in reference to such applications.

"My Lords already have fully recognized the great importance of Elementary Drawing to all classes of the community, in all relations of life, and have expressed their opinion that the first step to be taken to elevate public taste in the appreciation of correctness of form, is to cause Drawing to become a part of National Education. Their Lordships are therefore desirous that the Department of Practical Art should assist, as far as possible, in promoting the distribution of the means of accomplishing this object; but as the indiscriminate gift of examples to all applicants might lead to abuse, it is necessary to require some guarantee that the examples will be duly appreciated, which the mere request to have them does not imply.

"The principle which governs the whole proceedings of the Department, in all its branches, is to afford partial aid; and to encourage, but not supersede, public exertions in promoting Education in Art. Thus the means of study in the Museum of Ornamental Manufactures are afforded, Lectures are given, and Students are enabled to obtain the best instruction in all the Schools by payment of low fees in aid of the expenses; and my Lords consider that the same principle should be observed in the distribution of examples. They have therefore resolved that the Department shall have the power to assist Schools with examples for teaching Drawing upon the condition that the applicants are willing to pay half the prime cost of them. By this means, when a School is willing to subscribe 1*l.*, the Department will furnish examples of the value of 2*l.*, and so on, as far as the Parliamentary grants will permit.

"A list of the examples of Drawing Copies, Models, Casts, and Materials which the Department will be prepared to furnish on these terms, may be obtained of the Secretary of the Department of Practical Art, Marlborough House, London.

"Marlborough-house,
"October, 1852."

It is one of the most gratifying signs of the times to find, at length, the strong arm of the State held out to assist the promotion of substantial education. Hitherto, State money has run almost exclusively into military, clerical, or legal channels. A new direction has certainly now been given to it, if we may judge from this promising educational scheme, and from the paragraph in the Queen's speech, to which we adverted with eager pleasure immediately upon its publication from the Throne. The humanizing influences of these studies will not be long in making themselves felt, and we look forward to great and rapid results.

As regards the low ebb of public taste in matters of ornamental art, and the great want of this species of education on an extensive scale, we beg to direct our readers' attention to the following paragraph from the *Nottingham Journal*:

"We happen to know an instance of a a manufacturer employing the best designer of the day to supply him with a pattern, both new and 'true;' and three samples were immediately produced in one of the precious metals. The result of this was, that Prince Albert purchased one, the designer himself bought the second, and the third has been looked at in a silversmith's shop for a year or two without a patron!"

THE LAST DAYS OF THE CRYSTAL PALACE.

It will very probably interest our readers to know a few particulars of the removal of that structure, which has been the special wonder of a most wondrous age, and the like of which will never, in all probability, be seen again. Every vestige of the building has been removed, so that the ground once occupied by the palace has been reclaimed to its original state, and is now ready to receive the grass seed as soon as the weather may prove favourable for its being sown. The public may form some idea of the vast amount of labour necessary to remove the building, when we state that there were 16,000 tons of materials, the whole of which were removed by the first of the present month. It is due to Mr. J. Dalrymple, the able superintendent of Messrs. Fox, Henderson, and Co., to state that the entire charge of the removal of the Crystal Palace was placed under his care, and such were the admirable arrangements made by that gentleman that not only was the task completed within the specified time, but what is much more to his credit, without any serious or fatal accident. As conflicting rumours have gone abroad relative to the treasures underneath the building, we may add that the workmen removing the flooring were allowed to retain all they might find, which proved so trifling as not to call for special notice. Thus has the Great Exhibition passed away, so far as its external form is concerned, but the memory of its greatness, and the inspiring lessons it taught, will live so long as man can prize whatever is noble in nature or beneficent in tendency.—*Sunday Times.*

EXPERIMENTAL BALLOON ASCENT.

The fourth of the series of experimental balloon ascents projected by the Kew Committee took place from Vauxhall Gardens on Wednesday, the 10th instant, after having been several times postponed owing to unsuitable weather. The balloon was inflated from the Phœnix Gas Works, a supply of unusually light gas having, by the kindness of Mr. Church, the managing engineer, been prepared for the purpose. Mr. Green and Mr. Welsh, as on the last occasion, occupied the car. The sky was considerably obscured by clouds, the wind and the lower stratum of clouds moving very slowly from the north-east. The balloon was liberated at 2h. 21min. P.M., and moved off slowly towards the south-west, until it had reached an elevation of about 2,000 feet, after which it came under the influence of currents, which carried it with great rapidity towards the S.E. and E.S.E. The balloon continued to ascend until 3h 15min. P.M., when it has attained a height of 23,000 feet above the sea. The temperature on leaving the gardens was 50° Fahr., and at the greatest elevation it had fallen to 10½° below zero, or through 60½°. Both Mr. Green and Mr. Welsh experienced very considerable difficulty in respiration, with much fatigue consequent upon any exertion they were called upon to make. About the time of attaining the greatest height, the air below having become sufficiently free of clouds, it was observed that the balloon was being carried rapidly towards the English Channel. As there was not sufficient ballast left to enable him to cross with safety to the Continent, Mr. Green determined upon making a very rapid descent (even at the risk of damaging the instruments, &c), in order to avoid the water. He accordingly opened the valve (a proceeding which is rarely resorted to in descending), discharging gas very freely, so as to give a rapid descending motion to the balloon. Upon approaching the earth the remaining ballast was thrown out, and about the same time the neck of the balloon was allowed to be driven upwards; the empty portion of the silk being confined by the netting served to convert the balloon, in some degree, into a parachute. The car struck the earth with considerable violence, the concussion, as was anticipated, breaking several of the instruments. The descent took place at Acryse, about four miles from Folkestone. There was thus only about four miles more land available, a space which, at the rate of the balloon's progress in the higher part of its course, would have been passed over in four or five minutes. The rate of the upper current was probably sometimes more than sixty miles an hour.

It is plain, from the results of the last two ascents, that London, from its proximity to the sea, and the great prevalence of westerly currents in the upper regions of the atmosphere, is not well suited as a starting point for such experiments. Although this fourth ascent was, on the whole, rather hurried, a good and regular series of observations was obtained. The height reached was considerably greater than in any other of the series now completed, being about the same as that attained by Gay Lussac in his memorable expedition, and also in the late ascent of Messrs. Barral and Bixio. The Nassau balloon was inflated with carburetted hydrogen, whereas the French aëronauts used pure hydrogen. The greatest elevation ever attained by means of a balloon was during an ascent with the Nassau, by Mr. Green, in company with the late Mr. Rush, in 1838, the height exceeding 27,000

feet, the balloon being at that time considerably lighter and somewhat larger than it is now.—*Literary Gazette.*

THE NEW PREMIUM LIST OF THE SOCIETY OF ARTS.

In another part of this Number will be found the new List of Premiums which the Society of Arts has just published for its present, or 99th Session, which commenced on Wednesday last. Since the establishment of the society, in 1754, various institutions have been founded for specialities, as the Royal Academy, the Institution of Civil Engineers, the Royal Agricultural Society, the Institute of British Architects, &c., and to these the premium list now put forward does not address itself. There still remains a large field entirely unoccupied—the department of raw materials and manufactures, and the mechanism connected therewith, are still untouched by any other existing institution, and to these especial attention has been directed. The list is practical, tentative, and suggestive in its objects, and is aimed both at things which are just supposed to be realised, and at those the want of which is strongly felt. It is believed that the introduction to this country of new materials and substances from the colonies, whilst advancing the interests of commerce, would prove of singular advantage to the arts, as tending to reduce the cost and improve the manufacture of many articles, and so bring them within the reach of a larger number of persons.

Accordingly, premiums are offered for the importation of such articles as olive oil, oil from the cotton ed, new vegetable fibres, new ornamental woods, silk, &c., and for the discovery of plumbago, a growing desideratum now that the lead mines of Cumberland are nearly exhausted. In this section essays are also sought on such subjects as salt, iron, starch, artificial fuel, &c., &c., the sources from whence they are obtained, and the processes involved in their manufacture. Improvements in chemical products are likewise demanded.

In the section of machinery the greatest prominence has been given to those branches by which materials are wrought into condition for the market. The machinery for ginning cotton, for breaking and cutting flax, for grinding and dressing corn, for curing coffee, are thought to be objects well worthy of reward. So also of the means by which delicate specimens of fine art manufacture are produced.

Accounts of the rapid strides now being made in photography, talbotype, and calotype, are sought to be obtained, and attention is directed to the necessity for new and improved mechanism, and for convenient and portable means for taking views.

In the section of manufactures, several of the subjects evidently pointed at improvements very recently brought out; as, for instance, the manufacture of carpets, which, it is said, an American invention is about to produce more economically by the application of new materials and processes. Considerable impetus has of late been given to the manufacture of glass of all kinds; its more extended use in building, and for domestic utensils, and its recent application to photographic purposes, have rendered necessary vast alterations and improvements, so that there is much useful and interesting matter which it would be extremely desirable to collect.

The fine arts section is purposely restricted, so as not to interfere with other institutions. It is, therefore, devoted to drawings, outline, botanical, structural, and anatomical, of various natural objects, and to diagrams for the use of lecturers, the latter being a thing much required at the present time.

THE IRON STEAM FRIGATE "FAID GIHAAD."

Southampton, Nov. 20.—The iron steam-frigate yacht *Faid Gihaad*, Captain Caldbeck, arrived here yesterday, on her way to Alexandria, for which port, after completing her equipments and fittings, she will in a few days proceed, touching at Gibraltar and Malta.

The *Faid Gihaad* ("Favour of War") is a magnificent frigate yacht of great size, built in this country for the special service of his Highness the Pasha of Egypt, by Messrs. Mare, of Blackwall, under the supervision of Messrs. Zulueta and Co. (the agents in London of the Egyptian Government), and of the Peninsular and Oriental Company, who maintain the most intimate relations with the present ruler of Egypt. She has been constructed, regardless of expense, and according to the most approved models, while the general arrangements of the vessel, of her fittings and machinery, are after the most approved plans which science or ingenuity could suggest. The following are her dimensions:—Length, over all, 318 feet; on keel, 258; between perpendiculars, 293; breadth of beam, 40 feet; depth, 30 feet; burden, 2,280 tons; diameter of paddle-wheels, 42 feet; these are fitted with the patent feathering floats. The vessel at present carries no guns, as she will be exclusively employed by the Pasha for marine and pleasure excursions; but upon emergency she could be fitted with

two 10-inch Paixhans and 12 32-pounder broadside guns upon the upper deck, and 14 32-pounders on the main deck. The vessel is built of iron in waterproof compartments, from the design of Mr. Waterman, jun., draughtsman of Messrs. Mare and Co., of Blackwall. The engines, which are of 800 nominal horse-power, are from the celebrated factory of Messrs. Maudslay, Sons, and Field, and are on the double cylinder direct-acting principle, precisely similar to those of the Royal West India Mail steamer *Orinoco*. As specimens of engineering skill, combined with beauty of workmanship, they cannot be surpassed, and their working is most satisfactory and creditable to the distinguished firm from whose hands the engines were turned out.

The fittings of the cabin, the private apartments of his Highness, and the details of the saloon and cabin arrangements, perfected by Messrs. B. Taylor and Sons of Great Dover-street, are of the most beautiful and commodious description, while at the same time the greatest elegance of design has been secured, scarcely, indeed, inferior in point of richness of decoration, to the fittings of the Royal yachts in this country. Taken as a whole, the *Faid* is a magnificent embodiment of the mechanical and artistic skill for which the industry of this country is so remarkable.

The *Faid Gihaad* went out on a trial trip to-day to test her qualities as to speed, the Messrs. Zulueta, agents of his Highness, having invited a large party from London and Southampton to be present on the occasion. A special train from Waterloo-station brought a considerable number of gentlemen from the metropolis. The Mayor and corporation of Southampton, who had been invited, attended, as well as Mr. Andrews, the ex-Mayor, and many other gentlemen connected with the port and interested in steam navigation.

The course of the ship was laid towards the Solent, and thence to the measured mile in Stokes Bay, where several trials of speed were made, all of the most satisfactory nature, the ship going through the water at the rate of 13 to 15 knots an hour. The *Faid Gihaad* entered the Southampton Docks in the evening, the band playing the National Anthem; and the whole of the party highly pleased with their excursion, notwithstanding the unfavourable weather in which it was undertaken.—*Times*.

Coal has been discovered in large quantities at Puget's Sound, Oregon. This is a grand discovery, and will be the means of greatly advancing the commercial interests of Oregon.—*Scientific American*.

THE "ADELAIDE" SCREW STEAMER.

On Saturday this splendid vessel, built by Mr. Scott Russell for the Australian Royal Mail Steam Navigation Company, ran her trial trip from Gravesend, and, we are glad to say, fulfilled all the expectations entertained of her. The weather was extremely unpropitious, but nevertheless the chairman, Mr. W. Hawes, the directors, and a numerous party of friends were present. The maximum speed attained was 12½ knots per hour, and the Admiralty Inspectors present considered the results the greatest hitherto obtained from the screw propeller. The *Adelaide* is built on the wave-line principle, and glides through the water with a smoothness and ease which seem almost inexplicable. She was launched on the 13th instant. We have now to draw attention to a few points in which she indicates the remarkable progress which has recently been made in our system of naval architecture. In the first place, she has been completed within the six months. In the second place, she has been launched with her engines, machinery, and rigging in her, all in such a state that she could be sailed the day after she took to the water, a feat unprecedented in ship-building. Thirdly, she has been fitted with direct-acting engines, and oscillating cylinders, the most simple, compact, and economical application of steam power yet invented. Fourthly, her form represents the most recent theory of naval construction, and which unquestionably enables a ship to pass through the water in the smoothest and easiest manner. Lastly, as the chairman of the company, Mr. W. Hawes, pointed out, unusual pains had been taken to protect her against those two great sources of casualty at sea—fire and leakage. Her boilers, engines, and coal stores, are all separated from each other, and, even if several of the boilers or engines were disabled, she would still be enabled to proceed at the rate of 7 knots an hour, independently of her sails. She is also divided into fifteen water-tight compartments, and unusual precautions have been taken not only to render the bulkheads efficient, but to strengthen her framework in every possible way.

THE TRADES OF BIRMINGHAM.

The nail trade is now in a flourishing condition, and the men have received during the past week, in the neighbourhood of Rowley, an advance of 10 per cent.

The glass trade is also in a healthy state, and happily free from those differences which unfortunately existed for such a length of time between the masters and their workmen. The demand for all kinds of glass

is unusually extensive, particularly for lamps for the winter season, and in close connection with this branch, we may add, that the glass-cutting trade was never more prosperous. Men are at work night and day to complete orders for the home and foreign market, and good workmen in this branch are in requisition.

The pearl button trade, which for a long time past has been rather dull, has recently received a considerable impetus from some large American orders, which have been recently received for four-hole buttons. A new fashion has sprung up in some states for pearl buttons of comparatively large dimensions, worn by ladies down the fronts of their dresses, and if it becomes general, it will lead, at all events during the prevalence of the fashion, to a revival of the pearl button trade in this country, and the only drawback to its progress will be the scarcity of shell. It appears that, owing to the increasing demand for it on the Continent, it is with difficulty procured in this country.

The men hitherto engaged in the diving trade have also left their avocation and proceeded to Australia, where they find it more profitable to dig for gold than dive for pearls. The best pearl shell is now 136*l.* per ton, and steadily advancing. The black Scotch is scarce and unusually high in price. There is, perhaps, scarcely a branch of industry in Birmingham which it is more desirable should improve, owing to the vast number of men, women, and children dependent upon it for subsistence.

INSTITUTION OF CIVIL ENGINEERS.

The third sitting of the Institution of Civil Engineers was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the Chair.

The Paper read was "On the Drainage of Towns," by Mr. Robert Rawlinson, Assoc. Inst. C.E.:

The Author, believing the subject of the Drainage of Towns to be so comprehensive, that its full and complete consideration, within the limits of a paper to be read in one evening, would be impossible, restricted his remarks to a few general points likely to induce discussion and to elicit criticism, on former and present systems.

The historical portion was limited to showing, that in the now disinterred ruins of the most ancient cities, remains of drains had beeen found, and the *Cloaca Maxima* formed part of the wonders of ancient Rome.

Politically, the question of sewerage was very urgent, as the general health of the population influenced, to an important extent, the amount of misery, pauperism, vice, and crime existing in every city; and the increasing numbers, as shown by the census, demonstrated the necessity for providing for the extension of all large towns. In 1841. the population of one hundred and seventeen districts, comprising the chief towns, was 6,612,958 souls. In 1851, in the same districts, the number was 7,795,958. Disease had been rife in those districts, but it was shown that much of it might have been averted by timely sanitary precautions.

It was, however, to the social effect of town drainage that the attention of civil engineers would be most naturally directed, as under that head the leading principles of actual practice and the proposed modifications must be brought forward and discussed.

The questions of forms, dimensions, fall, cost, &c., of large and small sewers were passed over, with the remark, that they were matters of detail, to be fixed by the knowledge and experience of the engineer—contending, however, that the system most deserving commendation was that which enabled the greatest extent of sewerage to be well and cheaply accomplished.

The position of the outlet would be governed by natural local conditions, and the dimensions would be fixed by the area and the number of houses to be drained.

The material of construction was a question dependent entirely on experience and practice; earthenware pipes were, however, according to the author's views, the most economical and effective for all sewers and drains, within the capacity of the material.

It was contended, that town sewers could not receive the excessive flood waters, even of the urban portion of the site; they should never receive the suburban drainage, nor be combined with watercourses; they should be adapted solely to remove the solid and liquid refuse from the houses; and that it was safer for the inhabitants that there should be no sewers at all, rather than they should be of such dimensions as to become places of deposit. Pumping could be profitably adopted in certain situations, where, from the level, or the effect of tidal influence, the outlet flow might be checked. Intercepting sewers at mid-level were approved. Sewers of minimum dimensions were advocated in connection with pumping, and they should be capable of resisting internal hydraulic pressure, in case of the water rising in them.

The flow through sewers should be constant, and it was argued this could only be secured by having small conduits.

The extraordinary fall of rain at Birmingham, in July, 1845, when nearly two inches

of rain fell in half an hour, equivalent to 9·091 gallons per square yard, or 44,000·440 gallons per acre, was used as an argument against the building of large sewers below the level of the cellars, which, to be of service, must be capable of carrying off the heaviest rain-fall.

It was contended that the maximum surface water could not be passed through the sewers, but the natural surface outlet should be retained, to assist in carrying off the flood waters from the streets of large cities; though the fact of town sewers not having been originally intended to receive house-drainage or soil was prominently noticed. The want of connection between the houses and the sewers, in many parts of the metropolis, the absolute disconnection at Paris, and the prohibitory law, only recently repealed, at Liverpool, being quoted.

With regard to earthenware pipes, 3 inches diameter was considered too small for any drain pipes, and 30 inches diameter too large for the material of which they were made.

Pipes of 4 inches diameter would probably be found the least sectional area that should be used for house drains, and 9 inches for streets, and then not at a less gradient than one in sixty. It was decided that the beneficial use of pipe-sewers could not be pushed beyond certain limits; but the system should not be entirely condemned because it had been carried to extremes by those who wanted experience.

The general success of the use of egg-shaped pipe-sewers at Manchester was given as an example of the advantageous adoption of the pipe system.

The various kinds of joints were described, and it was recommended not to use pipes of larger diameter than about 15 inches, as larger sizes were apt to be fractured, from unequal bearing at the joints. The difficulty of moulding, drying, and burning pipes, increased, probably, as the squares of the diameters; if large pipes were moulded too thin, they are liable to be crushed in the finished sewer, and if they were moulded of extra strength, the wet pipes collapsed with their own weight in drying, were twisted out of shape in burning, or were imperfectly vitrified.

Sewers of radiated bricks, moulded for the purpose, were better and cheaper than large earthen pipes; a sewer thus constructed, 3 feet in diameter, being cheaper than one of pottery pipe of 20 inches diameter; their relative capacities being as the squares of their diameters, and there was no reason why brick sewers should not be as smooth within and as impervious as any pottery pipe.

After treating of side-junctions, gulley-holes, drain-traps, and ventilation, the use of cast-iron conduits in certain bad soils, was advocated, and as a summary, it was stated that all sewers should be below the lever of the cellars, and should be specially adapted to the work they had to perform. Rivers and natural steams should not form part of any system of town drainage, and in low districts the sewers should be capable of resisting internal pressure. Free outlets should be preserved, whether from intercepting, or low sewers; all small drains should be circular, and large ones oval, or egg-shaped; the largest radius should be adopted, and there should be extra fall in the curves; all sewers and drains should be impervious to water, and should present even and smooth surfaces; the gradient of all large sewers in steep ground should be modified or interrupted, and the materials used should be such as would resist rapid wear and bursting; wherever it was practicable, the outlet should be very free, and in all cases complete ventilation must be provided for. All mention of cesspools was omitted, as no locality could be considered as properly drained in which they were permitted to exist, except near the outlets, for ultimate use, for agricultural purposes.

The true purpose of town sewerage must be considered as the removal, with the utmost rapidity, from the vicinity of dwelling-houses and the sites of cities and towns, all the refuse, which, being liable to decomposition, could be conveyed away in water; and the more perfectly this could be accomplished, the better would be the work and the greater the credit due to the engineer.

The discussion of the Paper was commenced, but was adjourned until the meeting of Tuesday, November 30th, when it was announced that the whole of the evening would be devoted to it.

OPENING OF THE NINETY-NINTH SESSION OF THE SOCIETY OF ARTS.

The ninety-ninth session of the Society of Arts was opened on Wednesday evening last, at the Society's house in the Adelphi, when the usual address from Council on the policy to be pursued was read, and 232 new members were proposed for admission.

In the course of the address, the Council took occasion to refer to the working of the New Patent Law, as being as yet extremely imperfect, and, though much good had resulted from the labours of the Society in suggesting principles, much remained still to be done before full effect could be given to them. In particular, the want of the indexes directed by the Act, was deprecated

as seriously militating against the convenience and interests of inventors.

The concluding lecture of the series proposed by His Royal Highness Prince Albert, on the International Results of the Great Exhibition, was announced to be read by H. Cole, Esq., C.B., on Wednesday Evening next, the 1st of December.

The Exhibition of patented machinery and other articles will open early in the ensuing month, and arrangements have been made for a comprehensive exhibition at Christmas of Talbotypes, and photographic specimens generally.

THE BATTLE OF THE GAUGES.

It is announced that now the Birmingham and Oxford Junction Railway is opened with both the broad and narrow gauge rails on the same ground, the Messrs. England are prepared to renew their former challenge, given during the Exhibition, to run their light express engine, the *Little England*, against the large engine, the *Lord of the Isles*, belonging to the Great Western Company, fifty miles for 1000 guineas, or the winner to take both engines. They propose that each should take a load in proportion to its weight, or empty carriages only.

PROGRESS OF ENGINEERING AT BIRMINGHAM.

The engineering department of Queen's College, Birmingham, has commenced its important operations, under the able direction of Professors the Rev. W. Hunt, W. P. Marshall, H. Rose, and G. Shaw. The Rev. Dr. Warneford has enabled the College to erect a lecture-room, engineering workshops, and rooms for resident engineering students; and the same munificent patron has defrayed the expenses of a supplemental charter, under the provisions of which the council is enabled to confer by examination the degree of "civil engineer." Considering the present condition of engineering, mining, and architectural science, the unrestricted competition to which our trade and manufactures must inevitably be henceforth exposed, in connection with the fact that systematic education in arts and manufactures is established in some continental States, a cogent argument is supplied that this department should be energetically and efficiently carried out in Birmingham, the great centre of manufacture and mining operations, and the recent alarming and numerous accidents in ships, mines, manufactories, and railways, must be allowed to add to tha growing necessity of this branch of education, and to its importance and value to the public at large. The Council has earnestly appealed to their noble patrons, and to the friends of education generally, and to the great mining and manufacturing interests, for funds to enable them to purchase models of mechanical powers, machinery, sections of steam engines, expensive philosophical apparatus, &c., which appeal has been liberally responded to by the Earl of Dartmouth, Lord Leigh, Mr. Clement Ingleby, and other friends.

FITTINGS OF ST. PAUL'S CATHEDRAL FOR THE FUNERAL OF THE DUKE OF WELLINGTON.

The amount of work got through in preparing the extensive fittings of St. Paul's Cathedral for the recent state ceremonial, considering the extremely short space of time which has been available for the purpose, is quite unexampled, 2,000 loads of timber having been used, and 6,000 feet of gas-pipe, containing 7,500 jets, having been laid down. With reference to the jets, a good illustration occurred of the extraordinary facilities which, in this age, we enjoy in the execution of large contracts under pressure for time. The requisite number of them could not be obtained in London, and the electric telegraph having been put in requisition, a supply was procured, without an hour's delay, from Messrs. Milne and Son, extensive manufacturers in Edinburgh.

We are glad to hear that the strike which took place among the contractors' men early on Thursday morning arose more from excessive fatigue and exhaustion than from a design to screw exorbitant wages out of their employers.

New Patent Iron Cask.—One of these casks arrived in Liverpool on Friday, from the works of Messrs. Fox, Henderson, and Co., for the purpose of being tested here. The dimensions of the cask are, 38 inches diameter of head, 43 inches diameter of bilge, and 42 inches length of stave. It was sent to the works of Mr. Thomas Croft, where it was filled with water, and found to contain 214 imperial gallons. An ordinary wood cask of ordinary dimensions would contain only 150 or 160 imperial gallons. When full it was rolled freely over flags and pavement, and found perfectly tight and strong. Afterwards it was lifted from the ground and suspended by ordinary can hooks fixed in the chime ends. It proved perfectly staunch throughout all the trials to which it was subjected.—*Liverpool Albion.*

New American Planing Machine.—Several packages have arrived at Liverpool by the mail steamer *Atlantic*, from New York, containing articles forming together an American invention for a planing machine. It has been brought over to this country from the United States for the purpose of exhibiting and submitting to competent tests its capabilities, which are understood to be extraordinary, and to obtain an English patent for it. It was intended to have been sent to the Great Exhibition of 1851, in Hyde Park, but the inventor could not get it completed in sufficient time; and it comes now with the same general objects of public utility as in the case of the foreign articles sent to the Great Exhibition of 1851. This newly-invented planing machine is intended to be returned, after a lapse of time necessary for the intended purpose, to the United States. It is anticipated that, at the present time, when the tide of emigration is lessening the number of hands for manual labour generally, this invention will be to builders and contractors, an object of especial interest and importance.

THE IRON TRADE.

Birmingham.—The contemplated advance of 20*s*. per ton upon iron on the quotations of the last quarterly meeting has, we are informed, been demanded during the past week, at some large houses where there are more orders than can be executed, and been obtained. The general feeling, however, of the trade is against what is considered an imprudent advance, and the great probability is, it will not be declared general at the forthcoming preliminary meeting of the new year's quarter. Already accounts have been received from Liverpool of the injurious effects of such a sudden and unexpected advance. In that town the market is dull, sales limited, and few speculative transactions entered into, in consequence of the advance of price.

Within the last ten days some of the furnaces around Birmingham have been with difficulty carried on, in consequence of the scarcity of coal. The men, although now in the possession of full wages, will not work full time, and the usual embarrassment and annoyance unfortunately consequent upon prosperity is being felt by the employers.

America.—The commercial advices from the United States, brought to Southampton on Sunday last by the American Mail Steamship *Washington*, present no change of consequence in the iron markets of that country. The *Niagara*, however, which arrived at Liverpool on Monday, with advices from New York to the 9th, and from Boston to the 10th inst., reports that the market was depressed. 150 tons of Scotch pig iron were reported at 31 dollars six months.

Glasgow Pig-iron Market, Glasgow, Nov. 20.—In the early part of this week the pig-iron market was dull and inactive, with a disposition to sell at lower prices, probably occasioned by the less favourable advices per *Europa*. Yesterday and to-day a better feeling has been manifested, and a good business done at 57*s*. 6d. cash for warrants, at which we close buyers—sellers, 57*s*. 9d.; No. 1, g.m.b., 57*s*. 3d.; No. 3, 56*s*. 9d.; Gartsherrie, No. 1, 57*s*. 9d.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING NOVEMBER 25, 1852.

GEORGE FREDERICK PARRATT, of Piccadilly. *For improvements in life-boats.* Patent dated May 17, 1852.

Mr. Parratt's life-raft consists of a boat of ordinary construction, but hatched or covered in as much as possible, having attached to its sides wings, or projecting parts capable of being distended with air, and expanded from the sides of the boat, so as to offer a considerable buoyant surface for supporting persons in the water. The space between the sides of the boats and the wings is covered in with netting, and the expansion of the wings is effected by means of ropes passing through pulleys at the ends of a long spar, which moves on a pin at its centre, and is turned across the boat when in use, but at other times lies lengthwise.

Claim.—The mode described of combining parts into a raft.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in the construction of docks, basins, railways, and apparatus connected therewith for raising or removing vessels or ships out of the water, or on to dry land, for the purpose of preserving or repairing the same.* (A communication.) Patent dated May 17, 1852.

The peculiarity of this invention consists in constructing a floating dock in a series of air and water-tight sections or compartments, any number of which may be connected together according to the size of the ship or vessel to be docked. They are then submerged by filling them with water, so as to allow the vessel to be floated in over them; and when this has been done, and the vessel secured in her proper position, the pumps are put in operation to remove the water from the sections simultaneously, which causes them to rise gradually to the surface. The sections are guided and

steadied by means of air-tight tanks at their ends, and when they come to a bearing on the keel, the bilge blocks and cradle are run in until they fit the ship, and the pumping out of the sections is completed. This raises the vessel entirely out of the water, when she may be removed by means of a powerful hydraulic press on to ways laid down for that purpose, and where repairs may be effected. The several sections, when the vessel has been removed from them, can be at once used again for raising another vessel.

SAMUEL HALL, of Manchester, agent. *For certain improvements in the construction of cocks, taps, or valves.* Patent dated May 17, 1852.

In the improved cock or tap described by Mr. Hall, the principal valve is moved in the direction of the bore of the barrel by means of a stud on the end of its stem, which projects through the body of the tap, and which must be kept pressed in so long as the liquid is required to flow. The valve seat is covered with leather or other suitable material, and the valve is kept up to it by the internal pressure of the liquid. In order to prevent the admission of air when the flow of liquid is stopped, another valve is provided, which moves in the reverse direction to the main valve, and is closed by the recoil which takes place on a sudden stoppage, thus preventing the admission of air, and the vibration produced by such recoil, from being communicated to the liquid in the conduit pipe.

Claim.—The novel and peculiar construction of cock, tap, or valve shown and described, and especially the use of an auxiliary valve in taps of such or similar construction moving in a reverse direction, in order to prevent the recoil of the fluid and consequent admission of air causing leakage, vibration, &c.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For certain improvements in winnowing machines.* (A communication.) Patent dated May 22, 1852.

Claims.—1. Constructing and arranging winnowing machines in such manner, that the grain in passing through them shall be twice subjected to the action of the blast of air supplied thereto.

2. A method of maintaining a constant blast for the second winnowing of the grain by combining with the revolving fan, which moves irregularly, a compensating supply-valve.

3. The arrangement of an air-chamber between the place where the second winnowing of the grain is effected and the fan in which the impurities, separated by the current of air, entering the machine may subside before the air enters the fan.

4. A self-regulating discharge-valve, which prevents the admission of air into the machine, while it opens to discharge the impurities separated from the grain, and thus prevents their accumulating at the bottom of the air-chamber.

JOHANN STIERBA, of the firm of Messrs. Eisbrich and Co., of Prague, Bohemia, gentleman. *For improvements in furnaces, and in heating and utilizing certain products of combustion.* Patent dated May 22, 1852.

For description of Mr. Stierba's improved furnaces, see the first article of present Number.

JOHN JAMES RUSSELL, of Wednesbury, patent tube manufacturer. *For improvements in coating metal tubes.* Patent dated May 22, 1852.

These improvements consist in applying coatings of gutta percha, or gutta percha combined with other matters, to the external and internal surfaces of iron tubes; and are more especially applicable to preserving from oxidation the exterior of iron tubes internally coated with enamel. The coating of gutta percha is laid on with a brush in a state of solution, or by dipping the tube (which is left open at the ends or closed, according as both surfaces or the exterior only is to be protected) into warm solution of gutta percha, and repeating the dipping until a sufficiently thick covering is obtained. Each coating should be allowed to dry before another is laid on.

Claim.—The coating of iron tubes with gutta percha, or gutta percha combined with other matters.

JOHN SWARBRICK, of Blackburn, fire-brick-manufacturer. *For certain improvements in the method of manufacturing retorts used for gas and other purposes, and in the apparatus connected therewith.* Patent dated May 22, 1852.

The mode of manufacturing retorts adopted by the patentee is as follows:—He takes clay, as dug from the pit, and if it contains coal or other refuse, burns it until the coal is reduced to ashes; or, if no coal exists in the clay, then he mixes ashes with it, or other varieties of clay, until a suitable material for his purpose is obtained. He then grinds this with just sufficient water to produce a stiff, doughy mass, instead of adding as large a proportion of water as usual. Having taken a mould of the size required (and it is preferred that the moulds should be used in sections two to three feet long, with flanges for uniting them to each other), and placed it in an upright position, he introduces a core-bar into it, which he wedges

firmly into the centre; he then rams the stiff clay into the spaces between the mould and core, and, withdrawing the wedges, fills also the space occupied by them with the clay. The core-bar is then raised by a lever or screw, another section of mould joined to the first, the wedges replaced, and the operation of ramming in clay repeated until the required length of retort is produced. Retorts formed in this manner are dry enough to be at once removed to the oven, and when baked will be found to be free from cracks or fissures.

Claims.—1. The mode or means of making retorts for gas or other purposes, or moulds, in a vertical or perpendicular position, with the apparatus described for making the same.

2. The mixing of clay with coal-ashes or other suitable refuse or substance, or the mixing of different qualities of clay in such proportions as the quality may require, thereby forming an improved composition for the said purpose.

Samuel Cunliffe Lister, of Manningham, near Bradford, York, machine woolcomber. *For improvements in treating and preparing, before being spun, wool, cotton, and other fibrous materials.* Patent dated May 22, 1852.

The *first* part of this invention has relation to the combing of wool, and consists in employing gill-fallers of much narrower dimensions than usual, say from one-eighth to one-fourth of an inch, by which means the material can be operated on in small portions at a time, and less noil and better work will be produced.

The *second* part of the invention has relation to the combing of cotton. This has been hitberto effected in two machines—Heilman's and Lister and Donisthorpe's; in the former, the material is drawn off by nippers in detached portions, both ends of which are combed in succession; in the latter, the material is drawn out in detached portions, and fed on to a revolving comb, from which it is worked. Mr. Lister has now discovered that cotton can be effectually combed, if lashed or placed on to fine combs, by any feeding apparatus, without being drawn off in detached portions; and it is the combing of cotton in this manner that constitutes this part of the invention. The combing machinery may be varied, provided the combs are sufficiently fine—say from 10 to 40 or 50 teeth to the lineal inch; and the form of the comb may also be varied, although the patentee prefers a circular one.

Richard Roberts, of Manchester, engineer. ***For certain improvements in, and applicable to, boats, ships, and other vessels.*** **Patent dated May 22, 1852.**

This rather comprehensive title has been made to include the following long list of improvements, of which we have only space to give a general idea:—

1. The construction of vessels with passages outside the shrouds. 2. A mode of admitting light to every part of ships and vessels through openings made in the deck. 3. The construction of the chimneys of steam-vessels with spaces or compartments between them and their casings to promote ventilation, with which view also a steam jet is applied in these spaces if required. 4. The use of hollow beams for supporting the floors of apartments, and ensuring ventilation. 5. A mode of rolling iron to be employed in forming such beams. 6. The application of hollow keels to single hulled vessels. 7. The construction of the bottoms of vessels with cells, which may be used for containing water or shot, and other articles. 8. A mode of setting out the lines of the bows, and of constructing the sterns of vessels rounded and sloped from the bottom upwards, so as to dispense with stern post, &c. 9. A method of preventing the admission of sea-water into the fresh-water cells, by connecting the cells with water-tanks on a higher level, so as to create a pressure within the cells. 10. The stowing of water in flexible bags made to fit the cells. 11. Constructing vessels without deadwood so as to facilitate their being anchored by the stern. 12. An improved mode of applying the rudders, using one at the bow in addition to two at the stern. 13. An arrangement of propellers (six are shown) and a substitute for stuffing-boxes for the same. 14. A mode of attaching the masts of vessels. 15. A mode of constructing anchors (to some extent on the principle of Porter's patent.) 16. A contrivance for casting, heaving, fishing, and stowing anchors by means of a sloping channel formed in the ship's bows. 17. An improved form of steam boiler. 18. An arrangement of the same for marine purposes. 19. An improved arrangement of the coal-bins, and means of using railways and wagons for depositing coals on board ship. 20. A peculiar construction of self-acting, water-tight door for bulkheads. 21. A novel arrangement of marine engines and framing for the same. 22. A method of disposing of the exhaust steam. 23. A life-boat. 24. The use of swivel-pins for trimming vessels under way. 25. Certain machinery for raising and lowering ships' boats. 26. A means of disengaging the boats from the lowering tackle. 27. The use of railways to facilitate the stowing of ships' boats. 28. A spiral vane propeller. 29. A shield for ships of war. 30.

The use of sights for ships. 31. A mode of mounting and working guns. 32. An arrangement of elevator or endless belt, with scoops for raising cannon-balls and cartridges on deck from below. 33. The application of vulcanized India-rubber, or other elastic material, to close the vents of ships, but which, by yielding to internal pressure, will permit matters to be discharged, and close immediately after.

Specification Due but not Enrolled.

EDWARD THOMAS BAINBRIDGE, of St. Paul's Church-yard. *For improvements in obtaining power when fluids are used.* Patent dated May 22, 1852.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 15, 1852.

408. William James Mathias, and Thomas Bailey. Improvements in clocks and watches.

Dated October 23, 1852.

409. James Brodie. Certain improvements in the construction of sea-going vessels.

510. John Taylor and James Slater. Certain improvements in machinery, apparatus, or implements for weaving.

Dated October 25, 1852.

513. Samuel Plimsoll. An invention of more thoroughly and effectually cleansing, extracting, and separating, or fining ale, beer, porter, bitter beer, India pale ale, and other malt liquors from the yeast, bottoms, barm, sediment, and other extraneous matters and impurities with which it may be in combination.

Dated November 3, 1852.

622. George William Ley. The manufacture of a material to be used for certain purposes instead of wood, leather, millboard or oil-cloth.

624. Edward Lord. Improvements in certain machinery to be used in preparing, spinning, and weaving cotton and other fibrous substances.

625. John Cameron. Improvements in boilers for generating steam, and in feed pumps and apparatus connected therewith.

626. Charles Phillips. Improvements in apparatus or machinery for reaping or cutting crops of corn, or other crops to the cutting of which reaping machines are applicable.

627. Alfred Augustus De Reginald Hely. An proved shade or chimney for lamps, chandeliers, gas and other burners.

628. Alfred Sidebottom. Improvements in machinery or apparatus for cutting books, paper, and other substances.

629. Auguste Alexandre Tiesset. Improvements in apparatus for exhibiting notices and advertisements of various kinds.

630. Henry Spencer, and Edmund Taylor. Improvements in steam engines and boilers.

631. Harrison Blair. Improvements in apparatus for supplying steam boilers with water.

632. Nehemiah Hodge. An invention for discharging water from the hold of a navigable vessel.

633. John Macintosh. Improvements in projectiles and cartridges.

Dated November 4, 1852.

634. Emily Petit. A musical instrument, which she calls a "Euphotine."

635. Charles Pryse and Richard Redman. Improvements in a certain description of fire-arms.

636. Elisha Thomas Archer. Improvements in the manufacture of coverings for walls.

637. William Pope. Improvements in the ventilation of ships.

638. Augustus Brackenbury. An invention for precipitating the muriate of soda more economically than the process now adopted.

639. Joseph Raynaud. Certain improved means of imitating marbles and various coloured woods.

Dated November 5, 1852.

641. Collinson Hall. An apparatus to be used in the carriage of solid and liquid bodies.

642. James Pilbrow. Certain improvements in obtaining motive power.

643. Joseph Bunnett. Improvements in revolving iron or other metal shutters.

644. George Shand, and Andrew M'Lean. Improvements in obtaining products from tar.

645. Peter Fairbairn. Certain improvements in self-acting reeling machinery for reeling flax and other yarns into hanks.

646. George Fife. Improvements in steam and water gauges.

647. John Henderson Porter. Improvements in the construction of portable buildings and other structures.

648. John Frame. Improvements in looms for weaving.

649. Andrew Lawson Knox. Improvements in the manufacture or production of ornamental fabrics.

650. James Wotherspoon. Improvements in the manufacture or production of confectionary, and in the machinery, apparatus, or means employed therein.

651. Hesketh Hughes and William Thomas Denham. Certain machinery for the manufacture of fancy ribbons, ornamental trimmings, chenilles, fringes and gimps.

652. James Hadden Young. Improvements in weaving.

653. Charles Hampton. Improvements in pianofortes.

654. Richard Wright. Improvements in shafts and plummer blocks.

655. Robert Booty Cousens. Improvements in machinery for cutting cork.

656 Admiral the Earl of Dundonald. Improving bituminous substances, thereby rendering them available for purposes to which they never heretofore have been successfully applied.

Dated November 6, 1852.

657. John Melville. Improvements in the application of iron, and of wood combined with iron or other substances, to buildings and other constructions.

658. John Ryall Corry and James Barrett Corry. A new method of sewing gloves.

659. John Edward and Charles Gosnell. Certain improvements in brushes.

660. James Nicol. Certain improvements in the process of graining or ornamenting surfaces and fabrics.

661. Francis Bywater Frith. Certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, cords, beaverteens, and other descriptions of fustian goods.

662. Peter Fairbairn, and John Hargrave. Certain improvements in machinery for opening, combing, and drawing wool, flax, and other fibrous materials.

663. Joseph Victor Augier. Improvements in the manufacture of gas, and in the machinery or apparatus employed therein.

664. John Arthur Phillips. Improvements in purifying tin.

665. Thomas Hicks Chandler. Improvements in hoes.

666. Benjamin Baillie. Improvements in apparatus for drawing off and registering the flow of fluids.

667. William Frederick De la Rue and George Waterston. Improvements in writing cases.

668. Charles Frederick Day, and John Laylee. Certain improvements in sleepers and other parts of the permanent ways of railroads.

669. Jacques Morel. Improvements in figure weaving.

Dated November 8, 1852.

670. Charles Troupeau. An improved diurnal reflector.

671. George James Walker. Certain improvements in gigs and other carriages.

672. Stephen Carey. Certain improvements in the construction of viaducts, arches, bridges and other buildings upon a non-expansion principle.

673. James Brodie. Certain improvements in the propulsion of sea-going vessels.

674. Peter Fairbairn. Certain improvements in the ordinary screw gill machinery, when applied to the purposes of drawing, combing and heckling fibrous materials.

675. Jonathan Sparrow Crowley. Improvements in the means of, or apparatus for, working the signals and switches on railways.

676. William Edward Newton. Improvements in the manufacture of the carbonates of soda.

677. Andrew Robeson, junior. An improved mode of bowking or bucking cloth.

678. Robert Isaac Longbottom. Improvements in preventing vibration in railway and other carriages, and in axles.

679. Stanislaus Hoga. An instrument for ascertaining the existence of gold in the earth.

Dated November 9, 1852.

681. James Arnold Heathcote. Certain improvements in the mode of exhausting siphons or pipes for drawing off fluid.

682. Mark Newton. Certain improvements in the construction of carriages, and in the means of preventing the overturning of the same when horses take fright.

683. Jean Jacques Ziegler. Certain improvements in machinery for preparing to be spun cotton, wool, silk, silk waste, flax, tow, and other fibrous substances.

685. Robert Knowles. Certain improvements in boilers and apparatus for generating steam.

686. Nelson McCarthy. Improvements in boots and shoes.

687. Alfred Waterhouse. An improved filtering pot.

688. George Shadforth Ogilvie. Improvements in candlesticks and lamps.

689. Thomas Revis. Improved single seed drilling or dibbling machinery.

690. James C. Booth. Manufacturing chromate and bichromate of potash from chromic iron or chrome ore.

691. William Gossage. Improvements in obtaining sulphur from certain metallic sulphurets.

692. William Edward Newton. Improvements in the construction of axles or axletrees.

693. William Tudor Mabley. Improvements in ornamenting glass, and other transparent or partially transparent subtstances for windows and for other purposes.

694. Charles Griffin. Improvements in apparatus for fixing type or printing surfaces in a chase.

695. Robert Buncombe Evans. Improvements in the manufacture of charcoal.

696. John Down Gordon. Improvements in tuning pianofortes.

697. Obed Hussey. Improvements in reaping machines.

698. Oswald Dodd Hedley. Improvements in getting coals and other minerals.

Dated November 10, 1852.

699. Charles Fox. Improvements in the extraction or rendering of oil from fatty or oleaginous matters.

701. John G. Guinness. An improved mode of heating by air.

703. Auguste Baboneau. An improved apparatus for melting and mixing asphalt with bitumen and other substances.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," Nov.* 23, 1852.)

165. Moses Poole. Improvements in constructing bridges, viaducts, and such like structures.

199. Edwin Bates. Certain improvements for deriving motive power from expansive fluids, and the better application and economy thereof for propelling ships and other vessels in sea, river, and canal navigation, also in the shape and action of wind sails, the use of water as a motive power for driving machines, mills, &c., the construction of turbines, air and water-pumps, marine-pumps for emptying ships of bilge water, and other useful purposes.

250. William Armand Gilbee. An improved mode of disinfecting putrified and fecal matters, and converting fecal matters into manure, also applicable to the disinfection of cesspools, drains, sewers, and other similar receptacles.

419. John Henry Johnson. Improvements in the manufacture and applications of hyposulphite and similar compounds of zinc.

441. John Kealy. Improvements in machinery or apparatus for cutting or slicing roots.

464. John Gilbert. Improvements in mincing meat and other substances.

474. William Weild. Improvements in looms for weaving certain descriptions of pile fabrics.

493. George Price. A new or improved gas stove.

507. Felix Lieven Bauwens. Improvements in treating fatty matters prior to their being manufactured into candles and mortars, which are also applicable to oils.

568. Henry Robert Ramsbottom and William Brown. Improvements in preparing and combing wool and other fibrous substances.

570. Martin Watts. Certain improvements in machinery or apparatus for roving or preparing cotton and other fibrous substances for spinning.

582. James Sinclair. Improvements in engines to be worked by steam, air, or water, the said improvements being also applicable to pumps.

592. George Dixon. An improvement in bleaching palm oil.

606. John Jaques the younger. Improvements in chess and draught boards.

632. Nehemiah Hodge. An invention for discharging water from the hold of a navigable vessel.

644. George Shand and Andrew McLean. Improvements in obtaing products from tar.

645. Peter Fairbairn. Certain improvements in self-acting reeling machinery for reeling flax and other yarns into hanks.

646. George Fife. Improvements in steam and water gauges.

651. Hesketh Hughes and William Thomas Denham. Certain machinery for the manufacture of fancy ribbons, ornamental trimmings, chenilles, fringes, and gimps.

652. James Hadden Young. Improvements in weaving.

654. Richard Wright. Improvements in shafts and plummer blocks.

665. Robert Booty Cousens. Improvements in machinery for cutting cork.

656. Admiral the Earl of Dundonald. Improving bituminous substances, thereby rendering them available for purposes to which they never heretofore have been successfully applied.

662. Peter Fairbairn and John Hargrave. Certain improvements in machinery for opening, combing, and drawing wool, flax, and other fibrous materials.

664. John Arthur Phillips. Improvements in purifying tin.

665. Thomas Hicks Chandler. Improvements in hoes.

666. Benjamin Baillie. Improvements in apparatus for drawing off and registering the flow of fluids.

667. William Frederick De la Rue and George Waterston. Improvements in writing cases.

676. William Edward Newton. Improvements in the manufacture of the carbonates of soda.

677. Andrew Robeson, junior. An improved mode of bowking or bucking cloth.

680. William Thomas Henley. Certain improvements in electric telegraphs and in the apparatus and instruments connected herewith.

690. James C. Booth. Manufacturing chromate and bichromate of potash from chromic iron or chrome ore.

692. William Edward Newton. Improvements in the construction of axles or axletrees.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

Richard Prosser. Improvements in making of metal tubes. November 11.

Richard Prosser. Improvements in rolling metals. November 11.

Richard Barnes. Improvements in cocks or plugs for water or other fluids. November 11.

Robert John Smith. Certain improvements in machinery or apparatus for steering ships and other vessels. November 13.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, for improvements in the construction of springs for railway and other carriages. (Being a communication.) November 25; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Nov. 17	3390	William Redgrave	Grafton-street, Fitzroy-square	Cricket guard.
22	3391	James Horsfall	Birmingham	Annealing-pot.
24	3392	Thomas Crump	Derby	Self-acting service cistern for water-closets.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Nov. 12	477	Richard Watkins	Hereford-cottage, Dalston	Pen-reservoir.

CONTENTS OF THIS NUMBER.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1530.] SATURDAY, DECEMBER 4, 1852. [Price 3*d.*, Stamped 4*d.*

Edited by R. A. Brooman, 166, Fleet-street.

CUNNINGHAM'S PATENT SELF-REEFING TOPSAILS.

Fig. 4. Fig. 1.

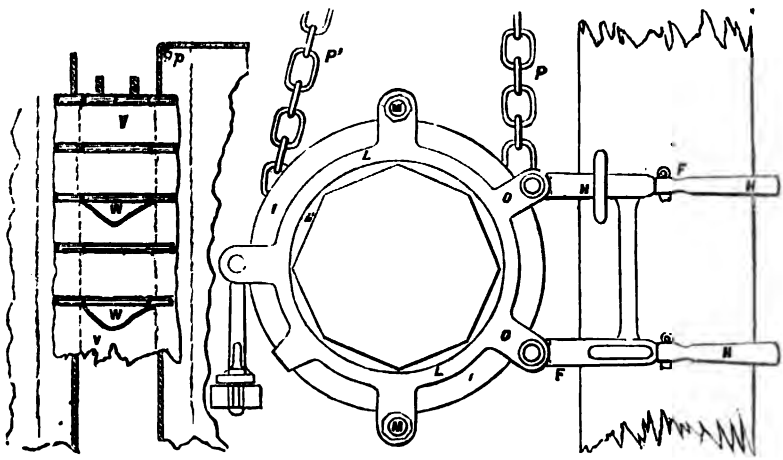


Fig. 3.

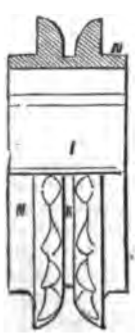
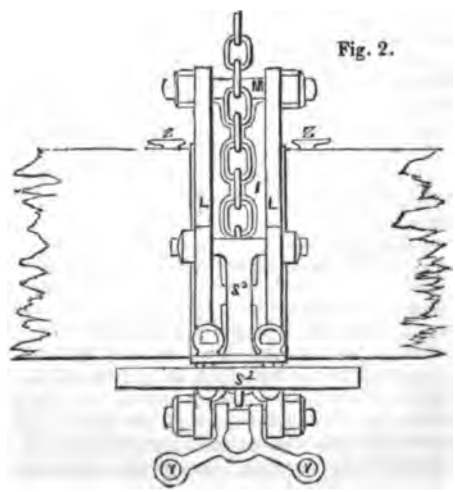


Fig. 2.



CUNNINGHAM'S PATENT SELF-REEFING TOPSAILS.

An opportunity was afforded us, a few days ago, of witnessing the operation of the admirable contrivance for reefing topsails, top-gallant sails, and courses from the deck, for which Mr. Henry Cunningham, R.N., obtained letters patent on the 30th November, 1850. So simple are the means which this ingenious mechanical arrangement places at the disposal of the seamen for accomplishing an object which, under the present system, cannot be attempted without encountering some degree of risk, and even then, without the certainty of succeeding in the contemplated manœuvre. Within the small portion of the currency of the patent which has already elapsed, its advantages have been eagerly sought after and largely resorted to in this country, in the royal and commercial navies of Holland, and in the marines of other continental states. Whether viewed, indeed, as a measure of economy in the working staff of a ship, or as conducive to her security by saving men from exposing themselves, saving time which frequently becomes in the highest degree precious, and enabling other duties to be more rapidly executed, we cannot conceive that a more useful invention could be added to those which of late years have so greatly improved our shipping.

On the occasion to which we refer, we had the satisfaction of being present on board the brig *Redport*, lying off the eastern end of the north quay of the London Dock. This vessel had had her maintopsail fitted on Mr. Cunningham's plan, and her master and crew spoke in the highest terms of its working on her recent voyage. Several gentlemen connected with shipping also expressed their satisfaction at its wonderful simplicity and efficiency, some idea of which will be conveyed by the circumstance, that the sail was close-reefed by one hand in less than a minute.

The accompanying figures exhibit the general character of the mechanism when intended to be applied to vessels of the largest class. For smaller vessels, means even more simple will be sufficient. In all cases, however, the principle upon which the construction proceeds, is the very obvious one of rolling the sail upon the yard, by causing the yard to revolve for that purpose, either by employing its own weight, together with that of the sail and its appendages, to produce the rotation, or by means of pulleys worked from the deck. Generally, the former method would be the preferable one, and before proceeding further, we propose to give a brief explanation of the necessary arrangements.

Fig. 1 represents a section of the yard and mast. To connect the yard with the mast, a contrivance is employed which, in nautical language, is termed a "parrall." It consists of two hoops H H, which are seen embracing the mast, yet made sufficiently large to slide freely upon it. They are made in two halves, connected by a suitable joint, which unite on the other side, and are there retained by the bolts F. The rings are also connected together, at some small distance apart, by upright bars. This method of construction evidently admits of the parrall being put on or removed from the mast with the greatest ease. To the parrall thus formed is attached the framework which sustains the yard at its middle point, and within which it is susceptible of revolving.

The preparation of the yard, previously to its being mounted, is shown in figs. 2 and 3. The latter figure represents a metal boss, which is securely fitted upon the middle of the yard, and revolves with it, occupying the position which is generally given to the sling-hoop. T, in fig. 1, represents a bolt which connects two rings, within which the boss and the yard revolve together. These rings are fitted upon collars or bearings on the boss, and they are strongly connected with the hoops of the parrall by the lugs O O, as seen in fig. 1. The bight of the topsail tye, or haulyards P^1, is a piece of chain, which lies in a groove R formed in the centre of the boss I, fig. 3. In the sides of the groove are a number of "whelps," or teeth, which take into and embrace the several links of the chain.

This is the principal part of the construction, and its working will be readily perceived. The fore-end P of the tye is made fast above, and the other end P^1 is slackened whenever it is necessary to take in a reef. When that end is let out, the links of the chain take hold of the teeth in the groove of the boss, and cause the

yard to revolve. In this way the sail is wound upon the yard, and the surface exposed to the action of the wind diminished. It is evident that the weight of the yard and sail tends to facilitate the operation, and thus the greater thickness and weight of the canvass, instead of rendering more difficult the work of reefing, actually lessen it. If the operation be reversed, a reef will be shaken out; for this purpose it is only necessary to haul upon the slackened end of the tye.

To enable the sail to be wound upon and unloosed from the yard, it is necessary that some provision should be made for the free revolution of the yard in the rings at its middle point. The contrivance to accomplish this purpose is shown in fig. 4. An upright slot is formed in the sail, reaching from the top downwards to a little below the close reef. The edges of the slot are "roped" or finished with the usual rope-binding, and then covered with leather. A set of stretchers or travellers,—of which the specification describes three varieties,—connect the opposite edges of the slot, but are so perforated as to allow the sail on either side, with its rope edge, to pass freely through. These stretchers are regulated at equal distances apart by means of "grummet-straps" passing through the perforations, and they are covered with canvas on each side, so as to cover the slot as shown in the figure. The lower part only of the canvas is attached to the sail, and the upper traveller is furnished with a screw-bolt, by means of which the canvas strip, with the other travellers, is raised, when a reef is let out. When a reef is being taken in, and the sail is coiled upon the yard, the "ropings" and the sail on either side pass through the perforations in the travellers, and the cam slides down with them.

A "lap-over" is fitted to the top of the sail, to cover the jack-stay and prevent friction. The jewel-blocks at the yard-arms turn upon the points of attachment, so as to resist being turned over by the rotation of the yard.

In many cases, and, indeed, with few exceptions, the boss and chain may be superseded by the use of a strong strap coiled upon the yard—a form of the invention which the specification includes.

The advantages of this elegant and highly effective mode of reefing hardly need being pointed out. There is scarcely a nautical man, whatever may be his prejudices in favour of the practice to which he has been accustomed, who would not readily acquiesce in its superior merits, and hail it as a boon, as all have done who have had an opportunity of becoming acquainted with it. Where vessels are "short-handed," or it is necessary to make sail speedily from reduced canvas, or to reduce sail immediately, its useful application is sufficiently evident. With its aid, many a minute may be saved which frequently would seal the doom of a noble ship; and, in any case, employers have the means of introducing into their affairs a judicious economy in the reduction of their crews, which may be set down, at the lowest estimate, at one man for each sail in which it is applied, and of saving, by the diminished duration of the voyage which henceforth becomes clearly practicable. But above all, on the score of humanity, this valuable invention ought to come into general use, when it is only considered how much the hazardous character of sea-service is increased by the practice of sending men aloft.

We have before us a sheet of testimonials, from a variety of owners and masters, who concur in speaking most highly of this invention, with reference to each of the points on which it recommends itself; but we conceive that the two following incidents will serve as a sufficient illustration of the capabilities of Cunningham's topsail under trying circumstances.

The brig *Speck*, only a few days ago, parted her cables and got upon a lee-shore, and was obliged to carry a press of sail in order to get into Portsmouth. By the use of the patent topsail, which enabled her to make sail and reduce sail as quickly as she desired, she managed to run into Portsmouth in safety. But for this powerful assistance, she must certainly have gone ashore.

For a second instance of the practical efficacy of the invention, we may refer to the *J. C.*, a new brig. This vessel was going into Sunderland during the last heavy gale which visited that part of the coast, and before she came to the broken water, she was under close-reefed topsails. Instantly the men set to work and shook out all her reefs, and the vessel was driven through the broken water in safety. Other vessels in the same circumstances, but not fitted with the patent topsail, broached

to, and were taken aback. The opinion of competent sea-officers at Sunderland is, that had these vessels been fitted with Cunningham's topsails, they, too, would have got through safely.

In conclusion, it is only necessary to observe that this description of topsail can easily be fitted to every vessel rigged according to the present system—all the particulars necessary to be known for fitting it being the tonnage of the vessel, the depth of the close reef, and whether it be a steam or a sailing vessel. The adoption of the patent supersedes the use of reef-tackles, ear-rings, points, cringles, and Flemish horses. As an additional point of economy resulting from the use of this invention, it is proper to mention that the durability of the sail itself is immensely increased; since the absence of the points at once removes the destructive abrasion of the canvas, which is the inevitable consequence of their flapping against it.

This important invention is rapidly increasing in favour in our own and foreign commercial services, and seems destined to give a new impulse to nautical art.

METROPOLITAN TELEGRAPH.

Sir,—The streets of London have been in many places broken up of late, for the purpose of laying down the electric telegraph wires connecting various central points in the metropolis.

As the feasibility of insulating these wires under water is now thoroughly established, it appears somewhat strange that the Thames itself has not been more frequently used in completing the various circuits, and there is one junction in particular which I would venture to suggest for immediate consideration.

In Westminster we have, under the same roof, our Houses of Legislature and our Law-courts; while, within a very confined space in the city, there may be found situated banks, offices, exchanges, and innumerable places of business, each of which requires frequent communication daily with the West-end.

It appears, then, that a line of telegraph laid along the bed of the Thames might be extensively used, if branch wires diverged to the Mansion-house and Royal Exchange at one end, the Temple and Lincoln's-inn towards the centre, and the law-courts and houses of Parliament at the other extremity.

Barristers, whose chambers are in Lincoln's-inn and the Temple, have sometimes ten or twelve messages every day between these places and Westminster-hall; and if from an office in Fleet-street these messages could be sent for some trifling charge—say 6d.—to the corresponding office in Westminster-hall, their number would be increased so as amply to repay the small outlay required for sinking a wire in the mud-banks of the river, establishing the offices and messengers, and every other contemplated expense. If the wire-rope were placed but two feet or so beneath the surface, it would seldom be liable to disturbance; for all the craft on the river are either moored at certain buoys, or, if anchored now and then, they are so only in deep water, out of the half-tide beach, where the telegraph would be placed. Perhaps this suggestion may be taken up by those who could carry it into practical effect.

I am, Sir, yours, &c.,

J. M.

Temple, Nov. 30, 1852.

TAYLOR'S SCREW-PROPELLER LIFTING APPARATUS.

The disastrous passage recently made by the ship *Melbourne* belonging to the Australian Steam Company, affords a striking illustration, if any were wanting, of the immense accession to the security of a screw-propeller vessel, which may be derived from the apparatus invented by Mr. J. J. O. Taylor for shipping and unshipping the propellers. This unfortunate vessel, after experiencing very severe weather, lost all her topmasts but one, a little past midnight on the 19th October. Great exertions were made to clear the wreck, and to right the ship; and when, at length, about the middle of the following day, it was thought this work had been perfectly accomplished, it turned out that a large

mass of cordage, sails, and other matters, were entangled in the screw, which being submerged deep in the water, was only accessible with difficulty. The engines having ceased working in this state of circumstances, the situation of the vessel became one of considerable peril, and signals of distress were exhibited at once. Vigorous attempts were made to get the screw clear, and for twelve hours knives and hatchets attached to long spars were employed for the purpose, but without any effectual benefit.

Now the *Melbourne* had been fitted with Mr. Taylor's propeller apparatus, which obviously furnishes an easy means of extricating from this danger any screw-vessel in which it is applied, and which, as not unfrequently happens, has become so circumstanced. The apparatus consists of a short horizontal shaft upon which the propeller revolves, and which can be connected with the driving-shaft, or detached from it at pleasure by simple means. In this state the propeller admits of being easily raised through the "trunk" or "well-hole," by a lifting apparatus worked from the deck. A contrivance so effective yet so simple, it might be thought, would have met with the decided approbation of practical men, and particularly of men in the position of Directors of the Australian Steam Company. Unfortunately, however, for the *Melbourne*, these gentlemen either did not appreciate the value of the invention, or discountenanced it altogether. Their intention not to use it was sufficiently shown by the fact that they had the trunk and lifting-apparatus battened down flush with the deck. In the trying emergency in which the *Melbourne* now found herself, great was the regret that a simple and undoubtedly useful piece of mechanism should have been neglected, the necessity for which was thus painfully evident; late as the moment was, however, the captain, very much to his credit, determined on using it as far as it was available in its present condition: and after several hours of additional labour, in which a large number of the passengers assisted, he succeeded in raising the propeller sufficiently to clear the encumbrance, and about midnight of the 20th the screw was replaced. Thus did this excellent contrivance become the means of saving the vessel.

This apparatus is now used in all Her Majesty's screw steam-ships, and in those lately built and now building for the French and Peruvian Governments, and the General Screw Steam Shipping Company.

THE MAGNETISM OF TORSION.

We translate the following article from the French scientific journal *L'Institut*, of the 19th inst., on the subject of magnetic currents of induction produced by the torsion of iron. This was a communication from M. Mertheim to the Academy of Sciences at its last sitting, and details the results of his experiments, which will be found to have an important bearing on several mechanical questions:

It has long been known that a thread of iron, submitted to the action of terrestrial magnetism, becomes permanently magnetic when made to undergo a considerable amount of torsion equally permanent. An explanation of this circumstance has been attempted, in saying that the torsion acts in the same manner as every other mechanical disturbance, that it promotes the decomposition of the two magnetic fluids, and that at the same time it gives to the iron a certain coercive force. That opinion rests upon facts imperfectly observed. Torsion acts in a manner quite peculiar, in forcing the metallic molecules to arrange themselves spirally, and in thus giving to matter itself the form which Ampère has assigned to interior currents. Torsion produces temporary magnetic effects when it is temporary, and permanent effects when it is permanent; and these effects cannot be reproduced by any other mode of action of mechanical forces.

Temporary Effects—A bar of iron, magnetized to the point of saturation, becomes partially demagnetized at the moment it experiences a temporary torsion, and remagnetized at the moment of contrary torsion (*détorsion*), or, in other words, it is traversed by an inverse current during the torsion, and by a direct current during the contrary torsion, whatever may be the direction in which this torsion takes place.

We understand by "magnetization to saturation," the state of magnetic equilibrium in which a bar of iron is when it has received all the magnetic excitement it is susceptible of acquiring under the action of a given current, or which, after the interruption of that current, has already lost all which it was unable to keep. So long as

that equilibrium is not established, torsion and contrary torsion only act as other mechanical disturbances.

The manner in which the experiment is made is as follows:—A bar of iron, well heated beforehand, 1 metre in length (nearly 40 inches), and 15 millimetres in diameter (nearly six-tenths of an inch), is rigidly fixed at one of its ends, while the other is placed in the centre of a wheel, by means of which torsion in contrary senses can be produced upon it. It has two spirals, of which one is intended to receive the current of a single element of Daniell, while the other serves as a spiral of induction. The latter is placed in communication with a galvanometer sensible to the astatic needle. It is unnecessary to observe that the two spirals are sufficiently remote from one another to prevent direct induction.

The establishment of the current causes the needle to move through an angle > (greater than) 90° towards the right. The north pole is found to fit into the spiral (*encastré*), and the south pole is twisted. When the current is made to pass in the contrary sense, the south pole of the bar fits in the spiral, the north pole is twisted, and the needle revolves towards the left.

The following Table will exhibit at a glance the results of the experiment:

Torsion to the Right.	Contrary Torsion.	Torsion to the Left.	Contrary Torsion.	Observations.
>90 right. 50 right.	>90 right. 45 right.	90 right. 20 right	70 right. 35 right.	The bar becomes magnetised. Every other mechanical disturbance acts upon the needle in the same sense as torsion.
3 left. 5 left. 20 left.	50 right. 35 right. 30 right.	12 left. 20 left. 20 left.	45 right. 45 right. 30 right.	The bar being magnetised to saturation, the application of any force which does not produce torsion, leaves the needle at 0.
˜0 left. 50 left. 12 right. 30 right.	60 left. 50 left. 40 left. 42 left.	90 left. 5 right. 14 right. 30 right.	75 left. 50 left. 40 left. 40 left.	The current was reversed, and the result was that the same facts were reproduced, but in a contrary sense.
>90 right. 50 right. 20 right. 20 right.	20 right. 0 5 left. 10 left.	90 right. 35 right. 30 right. 12 right.	10 right. 15 left. 15 left. 10 left.	The current was interrupted. The bar became demagnetised; itself at first at the point of saturation.

The coercive force in every mass of iron may be measured by the number of torsions necessary to make it attain the point of saturation.

Permanent Effects.—When a bar of iron, or a bundle of threads, has been magnetised by means of strong permanent torsion under the action, whether of the terrestrial current or of any other, it does not prevent the phenomena of an ordinary magnet. *All torsion—temporary or contrary torsion—which acts upon it in the direction of permanent torsion, produces magnetisation, or a direct current; and all torsion, or contrary torsion, which acts in the opposite direction produces demagnetisation, or an inverse current.*

This experiment is easily performed with two bundles of the same iron thread, suspended vertically, and twisted so as to make of the one a helix *dextrorsum*, and of the other a helix *sinistrorsum*. They both have their north poles above, and their south poles below and upon their being introduced into the spiral, the needle is moved towards the right. But after having placed the north pole of each bundle in the spiral, if temporary torsions be given to the south poles, it will be found that a torsion in the same direction will produce contrary currents, according as it is applied to the one or to the other of the two bundles.

The following results are obtained:

	Torsion to the Right.	Contrary Torsion.	Torsion to the Left.	Contrary Torsion.
For the *dextrorsum* bundle, which was first twisted from right to left.	15 left.	10 right.	15 right.	14 left.
For the *sinistrorsum* bundle.	15 right.	15 left.	15 left.	15 right.

It is only necessary, therefore, to add to the apparatus a commutator, to reverse the direction of the current after each semi-oscillation, in order to obtain, by means of the turning vibrations, a continuous current which may be rendered highly intense.

These facts appear to me (M. Wertheim) likely to raise theoretical questions of extreme importance. I propose to discuss them in a work on the torsion of solid bodies in general, upon which I have been long occupied.

PEAT CHARCOAL AS A DEODORISER.

We extract the following from the *Bucks Herald:*

"The offensive drains, at the end of the town of Aylesbury, on the Hartwell-road, which have so long been such a nuisance to the inhabitants residing in that part of it, are now rendered perfectly harmless by the wonderful effects of the filtration of the drainage through a peat charcoal tank. Not only is all the poisonous effluvium arising from them perfectly deodorised, but the drainage, when mixed with the charcoal, becomes a most valuable manure, and *pure water* is drunk from it. We hope to see the same plan carried out in other parts of the town, and it is much to be desired that the wise example set by the Local Board of Health of this place may be generally followed, and that the pernicious effects now arising from the practice of poisoning the land and the inhabitants by the use of *liquid* manure will be abolished by *law*. We look upon this step as a most important one in connection with the sanitary movement now in progress; for with such an *economical* and easily-applied agent at command, our rivers need no longer be polluted by being made the receptacles for sewerage; and should this country be again scoured by another visitation of *cholera*, there can be no doubt that this powerful disinfectant will be applied with the most important results. The apparatus consists of a brick tank, sunk in the ground, at the level of the outlet of the sewer, containing a bed of peat charcoal, about two feet in thickness, through which the sewerage passes off, perfectly inodorous, leaving the ammonia, phosphites and volatile salts with the charcoal. We believe his Royal Highness Prince Albert to have been one of the first persons who suggested the great importance of this system of sewerage —his clear mind at once seeing the important results likely to result from it. The peat charcoal is also in its dry state the most perfect preservative of all animal and vegetable substances."

One ton of peat charcoal (costing 3*l.*) doubles its value by taking up the sewerage as a deodorizer, and thus becoming a most capital manure, and at the same time all its noxious properties are got rid of, it being without smell. The value of this manure I am now having tested in Buckinghamshire, and I hope next year to show some most beautiful crops raised by it. When I first began to persuade the Local Board of Health at Aylesbury to try a peat charcoal tank, they stated that they could not afford to do it, the sewerage not being of any value there, as no one would buy it, the land in that Vale being so proverbially rich that it did not require any manure. I live six miles from thence; but I said that rather than the experiment should not be tried, I would give them the charcoal if they allowed me to carry away the produce of the tank, whenever it required refilling, which has to be done there about every month. Another objection was then made as to the expense of the wood necessary for it; this I also gave.

The result of the experiment has been the most complete success, and no sooner had I arranged to take away the sewerage, than I had two or three offers to take it off my hands; it has therefore ended in my only having the two first emptyings of the tank, the produce of which I have now lying under a shed at Chequer's-court, and we shall, I hope, next year prove its great value for agricultural purposes. I have

seen very offensive water perfectly purified and made drinkable in five minutes by being mixed with the charcoal, and passed once through blotting-paper. It is beginning to come into use in the hospitals, where its value will be immense. Bodies placed in it may be kept any time, it acting as a perfect preservative of all animal and vegetable substances. It will also be most important to the shipping interest that it should be brought into use in the navy, as it immediately deodorises the bad effects of bilge-water, &c., &c., and thus might often be the means of saving the lives of half a crew.

L. A. F. R.

Nov. 9, 1852.

MACHINE FOR CRIMPING IRON BARS.

Messrs. Slocum and Sayles, of Lansingburgh, Rennselaer County, New York, have taken measures to secure a patent for improvements in the above-named machine. It should be explained that this is a machine for bending bars of iron into a shape that is often employed, particularly for ornamental fences, house-work, &c., we mean the zigzag shape. The rolling mill employed for this purpose consists of two under rollers placed side by side, and of two upper rollers —the latter two running in bearings which can slide up and down in the framing, so as to recede from or advance to the under rollers. Between these two sets of rollers there slides a bed, which carries the dies intended to impress the desired form on the iron. The patent more particularly applies to the construction of these dies. They are formed in pairs, so that the projections of the upper die fit into the recesses of the lower one. Their shape, in general, is angular, and the upper die is so formed with joints that each angular piece can be forced into its corresponding cavity in the lower die, without the necessity of its fellow projections partaking of the motion. The bar of iron being placed between the dies, which are fixed on the moveable table, a chain or cord is attached from the table to the further of the lower rollers, so that the former may be drawn along as the rollers revolve. The upper rollers, which give the pressure, are forced down to their work by weighted levers; hence, when the machine is set in motion, the table and dies are drawn between the rollers, and the first jointed projection of the top die is forced into its recess in the lower die, thus giving the iron bar the desired shape. The table continuing to advance, is caught between the second pair of rollers, which hold the bar from shifting whilst the second projection is descending, and in this manner the process goes on until the whole length of the bar is fashioned into the shape required. The inventors do not confine themselves to this sort of die alone, but propose another mode also, in which both top and bottom dies are made flexible.

ELLIOTT'S IRONSTONE POTTERY PROCESS.

We have received from a Correspondent the following account of the Northamptonshire ironstone manufacture:

By adopting Elliott's new process for manufacturing bricks, pipes, tiles, pottery, &c., from ironstone, iron may be manufactured on a small scale to great advantage, by using the slag when in a fluid state running from the furnace, instead of throwing it away, as is customary, at an enormous expense of labour and waste of land. The coals and other materials being necessarily used for producing iron, will, of course be charged to that account, and the labour and other expenses saved by removing the hot slag will nearly, if not quite, pay all the labour of moulding the slag into bricks, &c. The turns at the blast furnaces are twelve hours each, and, in a furnace doing full work, there are four men and sometimes two horses, with boys, according to the position of the work, employed constantly in removing the hot slag. In a furnace of full size, there are 300 tons a week to remove, which covers and destroys a quantity of land, so that there would be four men per week transferred from an useless, although necessary, office to the moulding department, as well as the expenses of the horses, &c., saved.

The calculations show a profit of 4,900*l.* for seven weeks with one furnace.

The colour of the bricks will be light brown, they may be made either rough, smooth, hollow, plain, or ornamental, and in any form or shape require no plastering, and when used for building may be papered or painted as soon as covered in at any season of the year. Where iron-stone is not found, chalk, limestone, marl, loam, breeze, small coal, oyster shells, &c., may be melted very rapidly, in a reveberatory furnace with a heating stove attached, so that the material may be nearly melted by the waste heat before it goes into the melting hearth.

The number of bricks alone charged with duty, previously to the repeal of the duty in 1850, was about 1,800,000,000, and the annual duty amounted to between 500,000*l.* and 600,000*l.*

In 1851—2,500,000 tons of iron were made in Great Britain,

$$\left.\begin{array}{l}\text{7,000,000 tons of ore}\\ \text{2,700,000 tons of limestone.}\\ \text{13,000,000 tons of coals}\end{array}\right\}\text{consumed.}$$

8,000,000 tons of slag thrown away = 8 millions thousand of 2-inch bore pipes worth at 1*l*. per thousand, 8,000,000*l*.

If the brick duty had not been repealed, the slag could not have been manufactured into bricks without an alteration in the law. No mention is made of moulding the slag into any useful form in either Mushet or Overman's works, on Iron and Steel, or Dobson's "Treatise on Bricks, Pipes, Tiles," &c.

RAILWAY ACCIDENTS.

The following analysis of 1,000 cases of engine failures and defects, occurring on the London and North-western and subsidiary railways, is given by Captain Mark Huish, in his recent pamphlet entitled "Railway Accidents: their Causes and Means of Prevention:"

157 burst and leaky tubes; 92 broken springs; 89 broken valve spindles; 77 broken and defective pumps; 48 broken feed pipes; 40 broken piston rods and pistons; 34 broken and damaged valves and valvular apparatus; 34 lost and broken bolts and pins (various); 34 fire bars burnt out; 31 lost and broken cotters (various); 29 plugs and joints blown out; 25 broken and lost eccentric straps; 21 broken wheels and tyres; 21 broken and bent coupling and connecting rods; 17 broken sponge boxes; 17 broken and bent eccentric rods; 17 broken crank pins; 15 broken and shifted eccentric sheafs; 15 broken coupling and draw bars; 13 broken crank and other axles; 13 broken eccentric straps and bolts; 13 broken and damaged steam and suction pipes; 13 broken and defective reversing levers; 11 broken connecting-rod straps; 11 broken middle bearings; 9 broken spring bearings, screws, and buckles; 8 broken lifting links; 7 broken blow-off and other cocks; 6 broken quadrant studs; 6 lost and loose regulator spindles; 6 broken gibs; 5 broken stay in fire boxes; 5 detached ash pans; 3 smoke-box and chimney end on fire; 3 broken brackets of weigh-bar shafts; 3 feed pipes stopped up, dropped fire; 3 broken spring balances; 3 broken side blocks; 3 broken crank rods; 3 tubes drawn in (chimney end); 3 broken axle boxes; 3 broken slide valves; 3 broken right-hand bearings; 3 broken glands; 3 defective horse pipes; 3 broken piston rings; 2 broken breaks; 2 lost quadrant washers; 2 broken goss-head spindles; 2 mud-hole doors defective; 2 broken weigh-bar shafts; 2 broken brasses of driving journals; 2 broken studs of link motion; 2 broken catches of fire bars; 2 broken glass tubes; 1 nut of tender draw-bar; 1 broken tender eye-bolt; 1 defective whistle; 1 boiler burst.

This classification of defective parts will exercise a salutary influence in the construction of locomotives, by pointing out the necessity of greater strength and more perfect means of connection; and in this respect, the results of Captain Huish's long experience and close observation will lead to many substantial improvements in our locomotive system.

COLLISION ON THE GREAT WESTERN RAILWAY.

A collision of a most alarming and fatal character, occasioned by an express running into a second class passenger train, happened late on Friday 26th ult. on the recently opened line of the Great Western Railway to Birmingham. That it was not attended by a greater loss of life appears most marvellous. The unfortunate occurrence took place at Heyford-station, about 12 miles from Oxford and 15 from Banbury, at which particular part, there being rather a sharp curve, the station is not observable at any great distance. The passenger train which leaves Birmingham at five o'clock in the afternoon for London, and which, it is said, departed from that station at its proper time, reached Heyford between eight and nine o'clock, and, as we are informed, some fifteen minutes beyond its time, owing to the numerous slips which had taken place along the road, from the incessant rain that has lately fallen. About this same period, the down express train, which leaves Paddington at five, is due at Heyford, and not having to stop there, it might be imagined that the down rails would have been kept free of obstruction. From some want of forethought, however, on the part of those who had the direction of the train then halting at the station, the order was given to the driver of the engine to back his train into the goods' shed, for the purpose of taking on a goods' truck. This building being on the opposite side of the line, it became necessary for him to cross the down rails, in order to reach it. The shunting was commenced, and just as the train had nearly got over the line into the sliding, the whistle of the down express was heard. The second guard instantly called out, "Good God! bear a hand; the express train is coming down;" and it would appear that the driver of the engine exerted his utmost to get clear of the metal. Unhappily, however, such was the state of the rails, arising from the weather, that the express came up, and with fearful force the two came in contact. By a telegraphic message

from Birmingham it appears, that two, if not more, are seriously injured. One poor fellow, however, it is certain, has lost his life, namely, George Thompson, the driver of the engine of the express train. He has been in the service of the Company many years, and was much respected. His body was found on the permanent way, about 30 yards from the spot where the accident happened, but whether he was thrown there by the force of the collision, or seeing the impending danger, jumped off, is not precisely known. His fireman kept on the engine, which, we believe, was not thrown off the rails. The usual danger and stop signals are said to have been up to warn approaching trains, and that masters of stations are permitted to "shunt" in the manner observed in this melancholy instance. How that practice, however, could be sanctioned, when an express train was momentarily expected, is yet to be explained. As soon as practicable, the trains were re-made up and forwarded on their respective journeys. In the course of Saturday, several of the officials of the Company were engaged in investigating the circumstances attending the collision, but the result of their labours had not transpired, nor had the period for holding the inquest on the remains of the deceased engine-driver been fixed.

THE "W. S. LINDSAY."

There is at present lying in the East India Export Dock a very beautifully modelled iron ship of this name, built by the firm of W. S. Lindsay and Co., and intended for the passenger traffic to Australia. Her form gives promise of very extraordinary speed, while her internal fittings are in every way calculated to secure the comfort and health of those who sail in her. Her length of keel is 170 feet, and over all she is 207 feet; her breadth of beam is 28 feet, and her depth of hold 18 feet. She is about 1,150 tons burden, and 900 tons register, and her draught of water is 15 feet. She was built at Newcastle-on-Tyne, and presents when afloat a far lighter and more yacht-like appearance than has been attainable under the style of naval architecture which has hitherto prevailed in this country. Great expectations are formed of her sailing qualities, while to ensure safety, she has been divided into five fire-proof and water-tight compartments. Her deck is flush from the poop to the forecastle, the usual heavy bulwarks being dispensed with, and a light but strong balustrade substituted for them. The longboat is sunk in the deck, so as to be completely out of the way, and yet easily accessible for launching if required. Below, the "'tween deck" accommodation is unusually lofty and well-ventilated, while the arrangement of berths to insure the moral and sanatory welfare of the passengers is all that could be desired. With ships of such a character, the dangers and hardships of the emigrant during a long sea voyage can be faced without much cause for apprehension or uneasiness.

TEMPLETON'S MILLWRIGHT AND ENGINEER'S COMPANION. NINTH EDITION, CORRECTED AND IMPROVED, BY SAMUEL MAYNARD. SIMPKIN, MARSHALL, AND COMPANY.

The high reputation which this comprehensive, accurate, and compendious *vade mecum* of the engineer has acquired for itself, during a long and eminently useful existence, in which it has always been found adequate to the constantly-expanding requirements of every mechanical art, quite supersedes any necessity for commendatory observations on the part of its reviewer. It is a fortunate circumstance for the important community to whom it addresses itself, that a work so admirably conceived in its origin, and so successfully carried to a vigorous maturity by dint of intelligence, extensive observation, and unremitting energy, should now be edited by one peculiarly fitted for the task by his attainments in mathematics and the physical sciences generally, and the knowledge which he has ample and constant means of acquiring of the engineering wants of the day. In the present volume, the ordinary plan of the work will be found preserved. All the requisite data in various branches of the engineering profession are taken from the commonly-received authorities, compared with one another and with the results obtained by the author in experiments on a large scale conducted by himself, and then tabulated in a convenient form for practice. The uses of the valuable tables thus compiled is clearly explained in rules applying to the several cases which occur in practice, and which are illustrated by examples worked out under each head, to prevent all misconception. It may be said, indeed, that the pages of the "Companion" contain a substantial part of the education of the young engineer, as they condescend to instruct him in so much of arithmetic and geometry as is essential for the varied purposes of the book—a circumstance by no means to be despised. One very important feature in the present edition is especially worthy of notice. Wherever cancelling operations can be effected, the editor points them out and illustrates them. The im-

mense saving of arithmetical labour which is thus effected will be certain to be appreciated, and will induce sufficient attention to the method to bring it completely within the student's comprehension. For the rest, we have only to say that the Tables of the former edition have been carefully revised, and that, little as there was occasion for correction in point of typography, that little has been done. A more useful addition to the engineer's library cannot well be conceived.

INSTITUTION OF CIVIL ENGINEERS.

The fourth meeting of the session was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the Chair.

The evening was entirely devoted to the discussion of Mr. Rawlinson's paper "On the Drainage of Towns."

The town of Itchen was given as an example, where 60,000 feet of pipe sewers, from 20 inches diameter downward, had been in action for four months with perfect success; the average depth below the surface was 8 feet, and the outlet of the main sewer, which was 5,000 feet in length, and only 20 inches in diameter, was laid beneath the bed of the river, at an inclination of one in eight hundred. This was designed for the sewerage of one thousand houses, of which only two hundred were at present connected, and eleven hundred acres of urban and suburban drainage. It was admitted that some of the pipes, laid to a pumping engine, had broken, from being laid in bad ground, but after being relaid in wooden troughs, they had answered well; that the system of pipe sewerage had been, and must be, modified in practice, to adapt it to certain localities; that in a rocky uneven bed, loaded pipes would necessarily break, and if of large dimensions, they were very liable to be split longitudinally, or fractured transversely, as it was very difficult to get them accurately made and burned, and the false bearing of the sockets caused breakage. If in the case of Itchen, the rule laid down by Mr. Roe had been followed, the outlet must have been 5 feet diameter, instead of 20 inches diameter.

In the instance of Manchester, where, during the last eight years, a great extent of oval pipe drains, 25 inches by 18 inches, had been laid with success, it was explained that they were 2½ to 3 inches in thickness, and were laid with great care in very strong ground. The maximum size at which, even these thick pipes were preferable to brick sewers, was 36 inches by 24 inches. The smallest size made for small streets was 12 inches by 9 inches, and for foul water only 6 inches by 4 inches. The largest area draining into a pipe sewer was fifty acres.

The case of Croydon was mentioned, where, in consequence of the breakage of the pipes, it had been found necessary to excavate down to them, apply a covering of clay, and turn a ring of 4½ inches brickwork over them. It was shown that this breakage had in a great degree arisen from the system of alternate tunnelling and cutting, which caused unequal settlement of the earth on the pipes, under which they were certain to be fractured. In some cases they had been found to be softened by exposure to water, and then crushed under the superincumbent weight, causing stoppages of the flow, and rendering necessary the opening of the ground to reach them.

It was admitted that, for pipe drains laid at a depth of 15 feet, 12 inches or 15 inches diameter, was the utmost limit of practical utility; above that size, brick sewers would be preferable—particularly if hollow bricks were used. A brick sewer of 3 feet diameter would cost as little as a pipe drain of 20 inches diameter. The latter had only been adopted at Itchen on account of local difficulties, which were by these means more readily met.

It was contended, that the ordinary rainfall must be provided for in the size of the sewers, or else great injury to property must constantly ensue; that, with due precaution, there was little actual danger in excavating between houses for large sewers; that in sewering a town, the ultimate expense must be the main consideration, and if the streets were to be constantly torn up to discover stoppages, not only would the expense be much increased, but the inconvenience it would cause would be incalculable. It was incorrect to say that no fecal matter entered the sewers at Paris, when it was notorious that all the barracks, hospitals, prisons, and many other public buildings were directly connected with the sewers, and at their outfalls, into the Seine, the evidences of this connection was plainly discoverable. Numerous instances of stoppage were quoted, and specimens of the pipes partially stopped up, were exhibited; in cases of gradual stoppage, from the matters always present in house drains, it was very difficult to detect the actual spot, and great expense of digging up, and breakage of joints, &c., ensued. None of this occurred where good-sized main sewers were built, up which men could pass periodically to remove obstructions, or commencements of accretion, and make early repairs to prevent degradation from neglect.

At Liverpool, the Borough Engineer, who had great experience, had, since 1847, built

17 miles of sewers, of which there were 29,360 yards of brick, varying from 6 feet by 4 feet to 2 feet 9 inches by 1 foot 6 ins., and only 587 yards of pipe drains of 15 ins. and 12 ins. diameter.

It was stated, from Mr. Roe's Reports, that experience had shown the cost of cleansing small pipe drains to be greater than the expense of constructing an efficient sewer; that no amount of water sufficed to cleanse a small pipe drain if it once became stopped; but that in a large sewer, flushing and other means could be effectually adopted without any inconvenience on the surface.

The accordance between the practical results of Mr. Roe's Tables and Mr. Hawkesley's formulæ was examined, and it was shown that where the former would lead to the adoption of a sewer of 48 ins. diameter, the latter gave 49 ins. diameter; and in another case, the approximation was as near as 120 ins. to 124 ins.; in both instances the formulæ giving the largest area.

It was contended that the condition of a town, wherein provision was only made for conveying away the foul house water, &c., by pipe drains, would be deplorable, in cases not only of sudden falls of rain, but of a continued period of rainy weather; such a state being unworthy of the intelligence and skill of the present day.

Instances were given of the failure of pipe drains at Edinburgh, where, after a trial of a year, they had been abandoned, and it had been decided to replace them by brick sewers; chiefly on account of the repeated stoppages, and the consequent inconvenience to the public from breaking up the streets.

Numerous experiments were given, as to the transverse strength of pottery pipes; an 18-inch pipe, 2 feet long, resting in curved blocks at the ends, bore 53 cwt.; one, 9 ins. diameter, bore 64 cwt. It was stated that no practical difficulty existed in making perfectly vitrified pipes, up to 18 ins. diameter. Failures had chiefly arisen from bad manufacture, bad material, or inadequate thickness.

An instance was given of a case at Kilburn, where a great number of pottery pipes, 15 ins. diameter was found to have become filled with clay, through a small hole in one of them, and many of them were broken from unequal subsidence of the earth rammed upon them.

The monthly ballot for members was announced to take place at the Meeting of Tuesday, December 7th, when the discussion on Mr. Rawlinson's Paper, "On the Drainage of Towns," would be resumed.

SOCIETY OF ARTS.—INTERNATIONAL RESULTS OF THE GREAT EXHIBITION.

The second ordinary meeting in the present, or ninety-ninth session of the Society of Arts, was held in the great room of the Society's house, John-street, Adelphi, on Wednesday.

The Chair was taken shortly after eight o'clock, by the Right Hon. Lord Monteagle, when the minutes of the previous ordinary meetings were read and confirmed.

Mr. H. Cole, C.B., read a paper on the international results of the Great Exhibition, being the last of the series suggested by his Royal Highness Prince Albert. The paper commenced with a rapid retrospective glance at the antecedents of the Exhibition, and the state of feeling among manufacturers, which paved the way for that great event, and which in a great degree was created and fostered by the exertions of the Society. The first advantage to mankind at large, which, he submitted, had been the result of the Exhibition, was the promotion of international discussion among men of commerce and of science, as a rival mode of settlement of disputed questions to the hitherto dominant reign of diplomacy. A striking illustration of this truth was furnished by the International Sanitary Congress at Paris, to discuss the question of quarantine. The system of international postage, and the vast changes produced by the electric telegraph, acted in the same direction; but diplomacy was yielding gracefully to the pressure, and went hand in hand with it.

Alluding to the temporary measure of protection to exhibited articles, he said that 620 exhibitors had received certificates under the Act. The permanent measure of last session, amending the Patent Law, had already produced gigantic results. Since the 1st of October last, when it came into force, no fewer than 765 applications for new patents had been made. On the subect of patents, we might take a useful lesson from the United States of America, which issued 40,000 copies of their *Annual Report on Patents* at a cheap rate; while in France the great feature of the *Conservatoire des Arts et des Métiers* was its *Salle du portefeuille*, which contained about 12,000 drawings of machinery, and 20,000 *brevets d'invention*, all of which were accessible to the public at any time, free of cost, to be copied or traced.

Probably the most important of the statistics connected with this subject, were those of the great influx of visitors to the metropolis during the period of the Exhibition. The results in figures, as furnished by the machinery of the Alien Act, were exhibited in the following Table:

	Number of Arrivals	Population.	Proportion of Arrivals to every 10,000.
Holland	2,952	3,178,841	9·43
Belgium	3,796	4,335,319	8·75
France	27,236	35,400,486	7·69
Germany	10,440	15,813,022	6·60
Switzerland	734	2,113,748	3·47
United States	5,048	23,138,454	7·18
Spain and Portugal	1,774	15,699,441	1·13
Norway, Sweden, & Denmark	648	6,650,988	0·97
Prussia	1,489	16,171,564	0·92
Italy & Lombardy	1,489	22,740,344	0·65
Austria	672	32,862,770	0·20
Russia & Poland	854	60,362,315	0·14
Turkey & Egypt	86		
Greece	94		
China	8		
Not ascertained	1,107		
Total	58,427		

From the same official source it appears that in 1848, the foreign arrivals amounted to 19,340; in 1849, to 21,588; in 1850, to 28,801; and in 1851, from the 1st of April to the 30th of September, 58,427. This was an excess of 42,913 over the arrivals during the corresponding period of the previous year.

Among the multifarious wonders which the subject embraced, probably the greatest of all was the building itself. Though the erection of iron columns on beds of concrete was nothing new, and half a dozen claimants had disputed Sir Joseph Paxton's title to the gutter which bore his name, no country in the world had yet seen twenty acres of land put under glass, as last year was seen in Hyde-park. In this circumstance the genius of Sir Robert Peel again appeared upon the scene as the great agent of this great event; for had he not repealed the duty on glass, the work would never have been dreamed of, even supposing the great international barriers had not existed, in the shape of impolitic tariffs which he was the first to throw down.

As an illustration of the advantages of machinery, and of the critical caution with which its operation should be discussed with regard to labour, this circumstance was stated last year, when at the Royal Porcelaine Manufactory, at Meissen, the author observed an ingenious machine for turning oval dishes. A friend of his, remarking upon its utility, observed that it could not be introduced into our own potteries without the probability of a strike. If, however, the paper continued—if our potters could only see the machine at work at Dresden and at Berlin, and observe at what a low price the manufactured article could be produced abroad, and imported by us, they would be eager not to let the German potters have the exclusive use of it.

The author gave his opinion that the industrial progress of the United Kingdom was not inferior to that of any country. He was aware that this opinion was unpopular, but he rested it upon the statistics of the exhibited articles, and of the juries' reports. These were by no means correct; the subject was one of considerable novelty and difficulty, and, upon the whole, they would probably be received as a tolerably fair reflex of the general merits of the Exhibition, though the result had proved them to be altogether unnecessary.

The juries awarded 164 Council Medals; of which number the following Table showed the number taken by each foreign country, distinguishing the principal subdivisions:

	Total.	Raw Materials.	Machinery.	Manufactures.	Fine Arts.
United Kingdom	78	6	52	18	2
British Dependencies, Australia, India, West Indies, Mediterranean, South Africa	...	...	...	...	...
America	5	1	3	1	...
Austria	4	1	1	2	...
Belgium	2	...	1	1	...
China, Denmark, Egypt	...	...	...	...	...
France	54	11	22	20	1
Greece, North Germany	...	...	...	...	...
Netherlands	1	...	1	...	...
Persia, Portugal	...	...	...	...	...
Prussia and Zollverein	8	2	3	3	...
Bavaria	3	...	2	1	...
Rome	1	...	...	1	...
Russia	4	...	...	3	1
Sardinia, South America, Sweden, & Norway	...	...	...	...	...
Switzerland	2	...	2	...	...
Tuscany	2	1	1	...	...

It appeared, then, that out of a total of 164 Council Medals awarded among 13,937 exhibitors, 30 foreign countries obtained 86 medals among 7,076 exhibitors; whereas Great Britain obtained 78 among 6,861 exhibitors. If the aggregate value of the articles exhibited were taken into consideration, it would appear that the total value of foreign articles amounted to 670,420*l.*, while those on the British side amounted to 1,031,607*l.* Further, if the most valuable work of art were sought for, it would be found to be the produce of English genius. The demand of the Manchester silk-weavers for the abolition of protection was a gratifying indication that English manufacturers were not afraid of foreign competition, even in matters of fine art. We were probably behindhand in education in these matters, and abstract science was not so highly cultivated by us as it was by some of our neighbours: but then we had the satisfaction of knowing that when we wanted either we should be able to procure it on equitable terms.

Among the prospective objects which the Exhibition was progressively promoting, were the assimilation of the laws of different countries, the assimilation of coinage, weights, and measures, of which Dr. Whewell had so forcibly pointed out the importance, the abolition of passports, and increased facilities for international travelling, especially for working men. With regard to the application of the great surplus, the suggestion of his Royal Highness Prince Albert for the erection of an Industrial College on a site already purchased in the same vicinity, appeared to meet with general approval.

The paper having been listened to with great attention and pleasure,—

Mr. W. Tooke, one of the vice-presidents, proposed a vote of thanks to Mr. Cole, which was cordially responded to; as was also another to the noble Chairman, on the motion of Mr. Winkworth.

The meeting then terminated.

ROYAL SOCIETY.

The Anniversary meeting of the Royal Society was held on Tuesday, the Earl of Rosse, President, in the chair. His Lordship delivered his annual address, passing under review the state and prospects of science. The Medals were then awarded as follows:—The Copley Medal to Baron Humboldt, for his eminent services in Terrestrial Physics. This Medal was received for the Baron by Chevalier Bunsen, who, in a long and eloquent address, returned the thanks of Baron Humboldt for the high honour paid him by the Society. The Rumford medal was awarded to Professor Stokes, of Cambridge, for his very remarkable discovery of the "Change in the Refrangibilty of Light." One of the Royal Medals was awarded to Mr. Jaule, for his paper on the "Mechanical Equivalent of Heat," printed in the *Transactions*; and the second Royal Medal to Mr. Huxley, for his valuable papers on the "Anatomy and Affinities of the Family of the Medusæ." The election of council and officers for the ensuing year was then proceeded with; after which the society dined at the Freemasons' Tavern, the Earl of Rosse in the chair, supported by the Earl of Enniskillen, Sir R. Inglis, the Lord Chief Baron, Sir R. Murchison, Mr. Babbage, &c.

Metropolitan Buildings' Act. — The House of Lords has ordered a Bill to be printed, by which it is proposed, as a sanitary regulation, that Mr. Grant's invention to provide for the escape of foul air should be used in all buildings under the Metropolitan Buildings' Acts. Hitherto the invention has not been generally applied.

THE EASTERN STEAM NAVIGATION COMPANY.

The Half-Yearly meeting of the Eastern Steam Navigation Company took place on Wednesday, when the report presented was unanimously adopted. The Chairman (Mr. H. T. Hope), in explaining the position of the undertaking, stated the thorough conviction of the Board that the plan of constructing vessels of sufficient capacity to carry their own coals for the voyage was feasible, and that the traffic to be secured by an independent line of steamers to the East, unfettered by a Government contract, would prove remunerative. The importance of opening further communication with Australia, the ample powers possessed by the Charter for all necessary purposes, and the desirableness of proceeding with vigour in the completion of arrangements, were the points severally urged. The principal speakers, Sir C. Fox, Messrs. Geach, Field, Borrodaile, Martin, and Braine. In answer to questions, it was stated that the Directors were not under contract with any parties for building vessels, and that they were perfectly free to select the most competent. With regard to capital, it was not intended to proceed until the chief portion should be subscribed. One vessel only would at first be required to test the contemplated experiment.

American Firearms.—Colonel Colt, the

inventor of the celebrated repeating pistols, or revolvers, and other firearms which attracted so much public attention in the Crystal Palace, in the American department of the Great Exhibition of 1851, has found his arms to be so greatly in request in this country, not only for the private use of individuals, but also for officers in both departments of Her Majesty's service in Great Britain, and likewise in the various British possessions abroad, that he has deemed it expedient to make arrangements for establishing a place for the manufacture of them in London. With this intention the Colonel has recently arrived in this country from the United States, and has imported a large quantity of machinery and the necessary implements for the purpose.—*Times.*

THE IRON TRADE.

The excitement of the last few weeks continues unabated, and contracts are now everywhere being refused, unless at a further advance of 2*l.* per ton. How much of the present demand is of a speculative character, and what prospect there may be of a sustained export trade, seem to be matters of little consideration among the clamorous. That there is, and will be for some time to come, an accumulation of demand beyond the powers of production in our district, is taken as an undisputed fact. The proprietors of many large works have already been compelled materially to reduce their make, though under an unusual press of orders, from inability to obtain materials, particularly coals. During the last few years of unremunerative trade, not only have many inferior workings of mines been abandoned, but the usual preparations and provisions for future supplies have, to a great degree, been neglected; and in addition to the scarcity that has thus naturally ensued under so large an increase of consumption, unfortunately the late unpropitious weather has most materially impeded mining operations of every description. In several localities it has put a partial stop to them, by laying large tracts under water, and a considerable time must elapse before their previous amount of produce can be recovered. Both ironstone and coals are therefore realising unwarrantably high figures, and a further advance has been given, unasked, to the miners and colliers, making upon the whole 1s. per day to the latter, and 6d. to the former.—*Aris's Birmingham Gazette.*

THE TRADES OF BIRMINGHAM.

The principal feature of the past week in connection with the trade of this town is the large quantity of Australian gold which has found its way to the refiners. The quantity has been very large, the quality good, and no small portion of it is required to be worked up into fancy articles for re-shipment to the colony from whence it came.

The brass trade is brisk, the order books being well filled both for foreign and home consumption; but no small inconvenience is experienced in consequence of the scarcity and high price of copper. The continental demand for the article, and the partial desertion of the celebrated Burra Burra mines for the gold diggings, is the cause of this unfavourable state of the market, to obviate which the attention of some of the principal merchants and manufacturers is now being directed to other sources of production. A subject of great importance to us in connection with this great trade, is the recent discovery of copper mines in Staffordshire and Wales. The former, it is said, are to be worked immediately by a company of large capitalists, who will spare no expense in their endeavours to render the mines useful to the trade, as well as profitable to themselves. The mine discovered in Wales is situated on the Cwmgwilly estate, near Carmarthen, and it is expected will yield an ample supply. In the present state of the trade, with such a general demand for manufactured goods, this prospect of an increase of the raw material is of the utmost importance, and cannot be too highly appreciated.

A slight advance in the price of copper has taken place within the last few days, and the quotation has been for best copper 125*l.* per ton—an exceedingly high price, and most damaging to all contracts.

In connection with the copper trade, it may be well to state that the various tube works in the town are at full work, and the men making overtime. At the extensive tube works at Smethwick, great activity exists; and the Digbeth Battery Company are most actively employed. At these works, also, large quantities of telegraph wires are being manufactured, chiefly to complete foreign orders. The demand for brass tubing, for gas-lights, was never greater than at present, and is likely to continue throughout the winter.

Messrs. Heaton and Son, of Bath-street, have received a portion of the contract for making the copper coin for the forthcoming French Empire. The coins to be made are one, two, five, and ten centimes, and the contract has been divided between six houses, five French and one English. In order to facilitate the manufacture of the coins, Messrs. Heaton are preparing to remove a portion of their machinery to Marseilles,

where the work is to be executed. Five thousand tons of copper, it is computed, will be required for the first issue of the metallic currency, nearly 700 tons of which will be used by the Birmingham firm, and the execution of the work will probably occupy four years. As yet the designs and inscription have not been given out, but will be supplied to the contractors immediately.

In addition to this contract Messrs. Heaton have made arrangements for the extensive manufacture of a simple, but extremely useful article recently patented. It is a new stamped capsule, about one inch and a quarter in length, intended as a stopper for wine and other bottles, and a substitute for the cork now in use. The capsule is wormed inside, and the neck of the bottle is also wormed by a new process, so that it can readily be screwed down and made air-tight without the usual trouble of corking and uncorking by means of screws, &c. It is the invention of a Frenchman, who is said to have received an extraordinary large sum of money for it from a number of gentlemen in the direction of the Bank of England. The cost of the article complete will be considerably less than the price paid for ordinary corks, and a saving, exclusive of the convenience and durability of the article, will be effected by its adoption. By the ingenious machinery now in operation, many thousands can be made daily.

Salt in Ireland.—A company is about being formed in Belfast, with a capital of 50,000*l.*, to work the salt mines which have been discovered on the Marquis of Downshire's estate at Duncane. In connection with the preparation of the salt for commerce, chemical works are to be established, which will enable the Company not only to supply manufacturers with bleaching materials, but to export them in large quantities to other countries.

The Southampton Docks.—We are informed that the Directors of the Dock Company contemplate shortly proceeding with the construction of another new dock, to meet the requirements of their rapidly increasing traffic, which will probably cause an outlay of some 200,000*l.*; but that, in accordance with the honourable feeling that regulates their affairs generally, they intend not to do so until the old proprietors of shares have been paid some dividends, and that, should they determine to add to their stock, preference will be given to the old proprietors.—*Hampshire Independent.*

Metallic Casks.—A specimen of one of the metallic casks lately introduced at Liverpool for the palm oil trade, as well as for all other purposes where economy of space and the prevention of leakage are desired, was exhibited on Saturday, at the East India Docks. Its capacity is for 214 gallons, while a wooden one, occupying the same external space, would contain, it was stated, less than 160 gallons.

Novel Rope.—Griffin and Morris, of Wolverhampton, are now making one of the longest and heaviest ropes ever manufactured in this kingdom. It is a four strand flat rope, 350 yards long, and weighs nearly four tons; it is 9 inches wide at the top, and gradually tapers to 6 inches at the bottom. By this gradual diminution of the rope, which is the new principle adopted, and which Messrs. Griffin and Morris are now engaged in registering, there is a saving of a ton in the weight of the rope, while its strength while in use is undiminished, a saving of a ton of material, and the necessary removal of a strain of the same weight from the machinery by which it is used. The actual durability of the rope is, it is evident, also increased by the removal of the wear and tear to which the extra and unnecessary material would expose it.

American Enterprise in South America.—By the schooner *Lamartine*, which cleared at this port yesterday for Cumana, Venezuela, a party of adventurers go out furnished with a complement of machinery, for the purpose of raising treasure from the wreck of the Spanish vessel *San Pedro*, which was lost off Venezuela more than a century ago. It is supposed that the vessel had about nine millions of dollars on board, which were sent by the home Government to pay off troops in her dominions in the New World. Some two years since a portion of the present party discovered the wreck, and with the aid of a little apparatus for the purpose, succeeded in realising about 25,000 dollars, and cleared the wreck, so that they now anticipate operations will be comparatively easy. A steam-engine will be carried out, and also a diving machine, together with submarine armour, and all other apparatus deemed necessary for the most scientific fathoming of the "boundless deep." Should this enterprising company secure the whole of their supposed vastly rich prize, they will not only suddenly become millionaires in wealth, but millionaires literally "of the first water." — *Boston Transcript.*

The Caloric Ship.—The New York papers mention that Ericsson's caloric ship would be tested about the 1st of December, but it is now stated that she is not expected, under any circumstances, to make the passage to Europe in less than fourteen or fifteen days; so that, in the present stage of the alleged invention, its competition will

be against sailing ships, and not against the existing steamers.

Soirée of the Leeds Mechanics' Institution.—We understand that the Committee anticipate a brilliant and distinguished party of guests to assemble at the *soirée* on December 8, to be presided over by Lord John Russell. The Committee have already received letters accepting their invitations from Lord Beaumont, the Hon. and Very Rev. the Dean of Ripon, the Mayor of Leeds, the Right Hon. M. T. Baines, M.P., Sir George Goodman, M.P., Dr. Layard, M.P., the enterprising and accomplished discoverer of the remains of Nineveh; Henry Cole, Esq., C.E., superintendent of the Government department of practical arts; Robert Hall, Esq., Recorder of Doncaster and Deputy-recorder of Leeds; James Garth Marshall, Esq., Professor Phillips, F.R.S., &c.; the Rev. C. Wicksteed, M.A., president of the Leeds Philosophical Society; Ed. Baines, Esq., president of the Yorkshire Union of Mechanics' Institutions; and George Cruikshank, Esq., the far-famed humorous artist. The Committee hope to be favoured with the presence of the members from the West Riding, and also with that of several Noblemen and Gentlemen who are in correspondence with the institution on the subject.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING NOVEMBER 30, 1852.

JOHN HARCOURT BROWN, of Aberdeen, and JOHN MACINTOSH, of the same place. *For improvements in the manufacture of paper and articles of paper.* Patent dated May 22, 1852.

This invention consists in using hollow moulds, composed of perforated metal, wire, or other suitable material, and covered with felt, within which, after their immersion in a vat of pulp, a partial vacuum is created, so as to cause the pulp to adhere to or be deposited on the felt surface in a layer of uniform thickness. This process is applicable to the manufacture of sheets of paper and various articles such as envelopes, bags, cases, &c. The articles, after having been formed, are subjected to a drying process, and to pressure where their form will admit of it. The patentees also manufacture such articles with a reticulate fabric interposed between two layers of pulp, in order to obtain additional strength.

Claim.—The mode described of manufacturing paper and articles of paper, whereby hollow moulds or frames with permeable surfaces are employed, and within which moulds or frames a partial vacuum is obtained when making paper or articles of paper.

LOUIS VICTOR RUZE, manufacturer, of Gaillon, France. *For certain improvements in the manufacture of hat-plush and other similar silk cloths.* Patent dated May 22, 1852.

These improvements have relation to the finishing of hat-plush and other similar silk cloths, and consist in an arrangement of machinery in which the fabric is successively steamed and subjected to the action of cards and teazles mounted on a revolving drum, against which the fabric is caused to pass. The teazles are cleaned by brushes revolving in contact with them.

THOMAS KNOTT PARKER, of London-wall, carpenter. *For improvements in window-sashes* Patent dated May 22, 1852.

The object of this invention is the construction of window-sashes in such manner that they may, with facility, be removed from the frames, for the purpose of cleaning or glazing, and be again readily adjusted.

For this purpose the sashes, instead of having the cords and weights attached directly to them, as usual, are connected to runners or slips of wood, which slide up and down in the grooves formed by the sides of the framework and the centre bearings, and are weighted in the manner usually adopted with sashes. The sashes are hinged to the runners on one side, and attached to the opposite runners by thumb-screws. Suitable pins are provided to keep the sashes and runners in any desired position. When it is wished to open the sashes, the top sash is lowered, and the bottom sash slightly raised until the top edges of the two come flush with each other; the retaining pins are then removed and re-inserted in other holes, so as to secure the runners to the frame, and prevent them being raised by the counterweights, after which the thumb-screws which connect the runners with the sashes are removed. When this is done, the sashes can be opened out at right angles to the framework, and they may then be readily painted or glazed. To restore the sashes to their former position, they are turned back to their places, and the thumb-screws are re-inserted, and on withdrawing the retaining-pins, the sashes are again free to slide up and down as before. The sides of the sashes are rabbeted into the runners in order to prevent the entrance of wind or rain.

Claim.—The particular construction and arrangement of window-sashes described.

DAVID DICK, of Paisley, Renfrew, machine maker. *For improvements in the manufacture and treatment or finishing of textile fabrics, and materials.* Patent dated May 22, 1852.

This invention comprehends,

1. An arrangement of apparatus acting on the principle of the Jacquard loom, for weaving figured fabrics.

2. A mode of cutting or perforating sheets, cards, or webs, to be used in such apparatus,

3. An arrangement of fingers, or apparatus for twisting the fringes of shawls, and other articles.

JOHN MASON, of Rochdale, Lancaster, machine maker, and GEORGE COLLIER, of Halifax, manager. *For certain improvements in preparing, spinning, twisting, doubling, and weaving cotton wool and other fibrous materials; also in tools, or apparatus for constructing parts of machinery used in such manufactures.* Patent dated May 22, 1852.

The patentees describe and claim a large number of improvements in relation to the preparing, spinning, and weaving of fibrous materials. Amongst these are a method of impregnating wool with oil, by means of pneumatic or other pressure; the application of drawing rollers, combined with the "Patent Feeder" of carding engines; several improvements in the construction of condensing carding engines; a mode of spinning wool direct from the condenser engine; a mode of lubricating the spindles and bearings of spinning and other machines; an arrangement for stopping looms on the breakage or failing of the wefts, and several improvements on fancy weaving machinery.

WILLIAM WATT, of Glasgow, Lanark, manufacturing chemist. *For improvements in the treatment and preparation of flax or other fibrous substances, and the application of some of the products to certain purposes.* Patent dated May 22, 1852.

This invention consists of a mode of treating flax, hemp, and other similar substances, by saturation with steam or hot water, so as to separate the fibres from each other, and to obtain the extractive matter in a state fit to be used for feeding cattle, or for manure.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 30, 1852.

571. Thomas Sanders Bale and Frederick George Sanders. Certain improvements in machinery or apparatus for grinding and mixing clays, or other plastic materials.

585. John Whitcomb and Richard Smith. Improvements in the manufacture of carpets, hearth-rugs, and other similar fabrics.

857. James Rock, the younger. Improvements in railway carriages.

Dated November 10, 1852.

700. William Johnson. Improvements in machinery or apparatus for sowing,—being a communication.

702. Joseph Tringham Powell. Improvements in mixing, baking, and drying materials in the making of biscuits, and other articles where plastic materials are employed.

704. Louis Gabriel Guérin. Improvements in fire-places.

Dated November 11, 1852.

705. Robert Hawkins Nicholls. Stopping railway carriages.

706. Ernst Luedeke. Improvements in obtaining and applying motive power.

709. George Lucas. A composition for filling engraved cast or sunk letters, devices, or ornaments on or in brass, zinc, or other metallic plates.

710. James Noble. Improvements in combing wool, and other fibres.

711. Colin Mather and William Wilkinson Platt. Improvements in machinery for finishing linen, cotton, and other fabrics.

712. Christian Sharps. Improvements in breech-loading fire-arms.

713. John Henry Johnson. Improvements in machinery or apparatus for sewing and stitching,—being a communication.

714. Henry Huart. Improvements in storing and preservation of grain.

615. James Cowan Wyper. Improvements in the figuring and ornamentation of book-bindings, and covers of a similar character.

717. William Davis. Improvements in machinery for cutting files.

Dated November 12, 1852.

718. William Edward Middleton. A new or improved circular saw-bench.

719. Sir Charles Fox. Improvements in roads.

720. Henry Fletcher. Improvements in the application or electro-magnetism for the production of motive power.

721. Caleb Bloomer. Improvements in the manufacture of anchors.

722. George Kendall. Certain improvements in apparatus to facilitate the manufacturing of mould candles.

723. Daniel Henwood. Improvements in machinery for registering the number of passengers or persons entering public vehicles or vessels, theatres, bridges, or other places where it may be desirable to ascertain the number of persons entering therein.

724. Charles Seaton. Improvements in the manufacture of metal tubes, and in the machinery employed therein.

725. Julian François Belleville. Improvements in generating steam for producing motive power or heat.

726. John Henry Johnson. Improvements in reaping-machines, and in apparatus connected therewith.

727. John Henry Johnson. Improvements in measuring and registering the flow of fluids.

728. George Stenson. Improvements in apparatus for separating gold from auriferous sand and earth.

729. Thomas Day. Improvements in landing and screening coals, and delivering them into sacks.

Dated November 13, 1852.

730. George Philcox. Improvements in marine chronometers and other time-keepers.

731. Edward Davy. Improvements in the preparation of flax and hemp.

733. John Caborn. Improvements in corn thrashing and dressing machines.

734. Professor Andrew Crestadoro. Improvements in rapid communications between distant places and countries.

735. Robert Lucas. Improved machinery to be used in the preparation of cotton and other fibrous materials for spinning.

736. Somerville Dear. Certain improvements in

the arrangement and apparatus of looms for weaving centre or other large patterns or designs in linen, cotton, silk, wool, or other fibrous materials.

737. John Paterson. Improvements in apparatus for shaping collars, and other similar linen and cotton articles.

738. Richard Coad and John Peers Coad. Improvements in fire-places and means of applying heat.

739. Amory Hawkesworth. Improvements in life-boats.

740. Admiral the Earl of Dundonald. Improvements in apparatus for laying telegraphic or galvanic wires in the earth.

741. Samuel Sedgwick. Improvements in lamps.

742. Hugh Greaves. Improvements in the permanent way of railways.

743. Peter Forbes. Improvements in sowing or depositing seeds in the earth.

Dated November 15, 1852.

744. Gray Denison Edmeston and Thomas Edmeston. Certain improvements in steam engines, which improvements are also applicable to the regulating of water-wheels or similar machinery.

745. James Hogg, junior. Certain improvements in machinery for producing glazed or smoothed surfaces on paper and other vegetable fabrics.

746. Joseph Cowen and Thomas Richardson. Improvements in the manufacture of sulphuric acid.

747. Robert Reyburn. Improvements in the composition of lozenges and other confections.

748. Constant Jouffroy Duméry. Certain improvements in the manufacture of metallic pipes and tubes, and in the machinery employed therein.

749. Auguste Edourd Loradoux Bellford. Improvements in apparatus for inhaling iodine.

750. John Mirand. Certain improvements in the construction of electric apparatus for transmitting intelligence.

751. Peter Armand Le Comte de Fontaine Moreau. Certain improvements in lamps.

752. George Berry. An improved method of roasting coffee.

753. Robert Sandiford. Certain improvements in apparatus for block printing.

754. William Fraser Rae. Improvements in gas-heating and cooking apparatus.

755. James Robertson. Improvements in the manufacture of casks and other wooden vessels.

756. Francis Montgomery Jennings. Improvements in preparing flax, hemp, China-grass, and other vegetable fibrous substances.

757. Thomas Taylor. Improvements in apparatus for measuring water and other fluids, which apparatus is also applicable to the purpose of obtaining motive power.

758. William Edward Newton. Improvements in knitting-machinery.

759. Abraham Rogers. Improvements in apparatus used for forming sewers, tunnels, and ways.

760. John Dent Goodman. Improvements in the boxes and axles for carriages.

761. Samuel Holt. Improvements in weaving cut piled fabrics.

762. Joseph Burley. Improvements in apparatus for cutting fustians and other fabrics, to obtain a cut pile surface.

Dated November 16, 1852.

763. Joseph Slatterie Edwards. A self-acting pea kiln or apparatus for moving grain, pulse, seeds, malt, or any similar substances while drying, which insures a more rapid desiccation, and requires scarcely any of the manual labour now employed in kilns, to be propelled by steam, water, or horse power.

764. Thomas Chrippes, the younger. Improvements in the means of tilling land.

765. Joseph Johnson. An improved mode of producing ornamental articles, such as brooches, bracelets, dressing and other cases, work or other boxes, or other like articles, from a certain kind of wood.

766. William Marsden. Certain improvements in and applicable to looms for weaving.

768. John Wheely Lea and William Hunt. Improvements in utilizing the waste heat of coke furnaces.

769. François Vallée. Improvements in preparing, spinning, and doubling flax, cotton, wool, silk, and other fibrous materials.

770. John O'Keefe. A method of making watch cases by machinery.

Dated November 17, 1852.

771. John Thomas Way and John Manwaring Paine. Improvements in the manufacture of burned and fired ware.

773. Henry Russell. Improvements in piano-fortes.

775. Peter Armand Le Compte de Fontaine Moreau. Certain improvements in weaving elastic tissues.

777. William Watt. Improvements in preparing for weaving, and in weaving flax, and other textile materials.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," Nov. 30, 1852.*)

146. Edwin Lewis Brundage. Improved machinery for forging nails, brads, and screw-blanks.

204. Bendix Ising Jacoby. Improvements in the means of fixing artificial teeth.

210. Henry Webb and Joseph Froysell. Improvements in fastening knobs to door and other locks.

301. Samuel Smith. Certain improvements in looms for weaving.

353. Thomas Lacy. Improvements in apparatus for raising liquids, and in joints for uniting India-rubber and other like flexible tubing.

417. Pierre Augustin Puis. An improved chain or cable, and an apparatus employed therewith for certain applications.

451. Robert Brown. Certain improvements in the method of ventilating buildings or apartments, and in the apparatus connected therewith.

510. John Tayler and James Slater. Certain improvements in machinery, apparatus or implements for weaving.

584. George Thomas Selby. Improvements in steam boilers.

586. George Thomas Selby. Improvements in machinery for the manufacture of tubes and pipes.

593. Edward Lawson. Certain improvements in machinery for preparing to be spun hemp, flax, tow, wool, silk, cotton, and other fibrous materials.

595. Joseph John William Watson and Thomas Slater. Improvements in galvanic batteries, and in the application of electric currents to the production of electrical illumination and of heat, and in the production of chemical products by the aforesaid improvements in galvanic batteries.

624. Edward Lord. Improvements in certain machinery to be used in preparing, spinning and weaving cotton and other fibrous substances.

627. Alfred Augustus De Reginald Hely. An improved shade or chimney for lamps, chandeliers, gas, and other burners.

628. Alfred Sidebottom. Improvements in machinery or apparatus for cutting books, paper, and other substances.

633. John Macintosh. Improvements in projectiles and cartridges.

639. Joseph Reynaud. Certain improved means of imitating marbles, and various coloured woods.

640. Marc Klutz. An improved process and apparatus to be employed in ornamenting fabrics, leather, paper, and other surfaces.

657. John Melville. Improvements in the application of iron, and of wood combined with iron,

or other substances, to buildings and other constructions.

659. John, Edward, and Charles Gosnell. Certain improvements in brushes.

674. Peter Fairbairn. Certain improvements in the ordinary screw gill machinery, when applied to the purposes of drawing, combing, and heckling fibrous materials.

679. Stanislaus Hogg. An instrument for ascertaining the existence of gold in the earth.

685. John Knowles. Certain improvements in boilers, and apparatus for generating steam.

686. Nelson McCarthy. Improvements in boots and shoes.

694. Charles Griffin. Improvements in apparatus for fixing type or printing surfaces in a chase.

695. Robert Buncome Evans. Improvements in the manufacture of charcoal.

697. Obed Hussey. Improvements in reaping-machines.

702. Joseph Tringham Powell. Improvements in mixing, baking, and drying materials in the making of biscuits, and other articles when plastic matters are employed.

710. James Noble. Improvements in combing wool, and other fibres.

711. Colin Mather and William Wilkinson Platt. Improvements in machinery for finishing linen, cotton, and other fabrics.

712. Christian Sharps. Improvements in breech-loading fire-arms.

713. John Henry Johnson. Improvements in machinery or apparatus for sowing and stitching.

719. Sir Charles Fox. Improvements in roads.

722. George Kendall. Certain improvements in apparatus to facilitate the manufacturing of mould candles.

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755. James Robertson. Improvements in the manufacture of casks and other wooden vessels.

759. Abraham Rogers. Improvements in apparatus used for forming sewers, tunnels, and ways.

760. John Dent Goodman. Improvements in the boxes and axles for carriages.

761. Samuel Holt. Improvements in weaving cut piled fabrics.

771. John Thomas Way and John Manwaring Paine. Improvements in the manufacture of burned and fired ware.

WEEKLY LIST OF NEW ENGLISH PATENTS.

Moses Poole, of London, gentleman, for improvements in the elastic ribs, sticks, strips, and fillets used in the manufacture of umbrellas, parasols, and various other articles in substitution of whalebone and steel heretofore employed. (A communication.) November 27; six months.

Lewis Pocock, of Gloucester-road, Regent's-park, Middlesex, gentleman, for improvements in rendering sea and other water pure. Nov. 27; six months.

Pierre Jules Lamaille, of Paris, France, manufacturer, for certain improvements in the preservation of Japanned leather. December 1; six months.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Nov. 26	3393	F. G. Yates	East-road, City-road	Winder for string boxes.
,,	3394	T. Fallows	Manchester	Connector of flyers to spindles.
29	3395	J. Toulmin	Size-lane, City	Despatch box.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Nov. 26	476	P. D. Nolet	Castle-street, Holborn	Compressing apparatus.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1531.] **SATURDAY, DECEMBER 11, 1852.** **[Price 3d., Stamped 4d.**

Edited by R. A. Brooman, 166, Fleet-street.

TIZARD'S PATENT THRESHING-MACHINE.

Fig. 1.

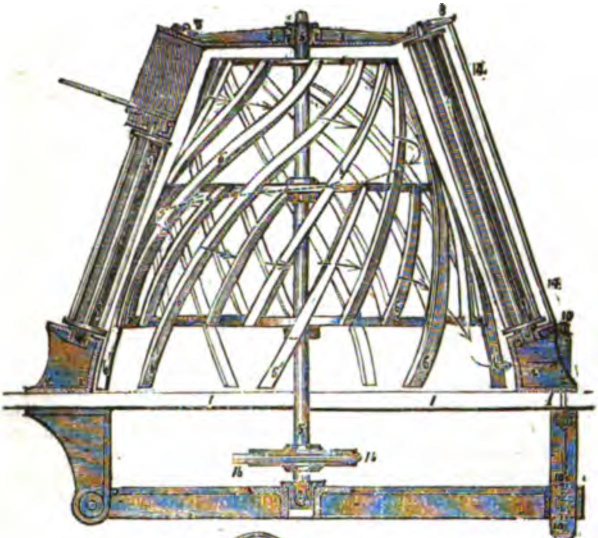
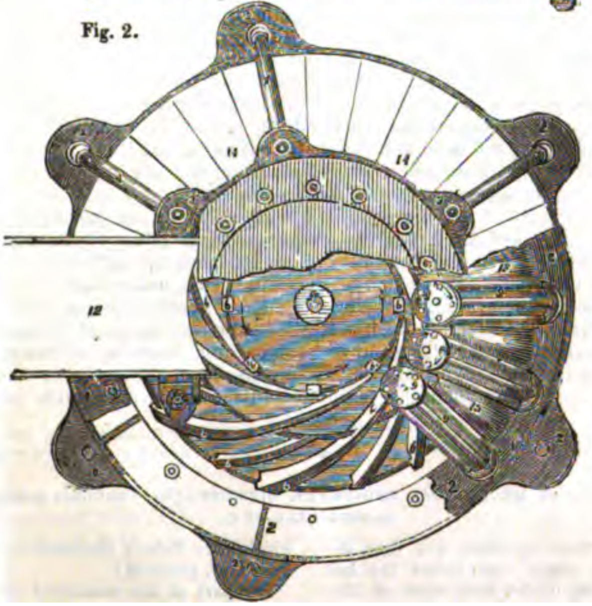


Fig. 2.



TIZARD'S PATENT THRESHING-MACHINE.

(Patent dated May 8. Specification enrolled November 8, 1852.)

The accompanying figures represent an improved threshing-machine, which forms part of Mr. Tizard's patent. It possesses the advantage of novelty and seems well adapted to threshing all kinds of grain without bruising it.

A vertical section of this machine is exhibited in fig. 1, and fig. 2 is a general plan. 1 is the barn or stage-floor on which the machine is erected; 2, a circular base-plate, bolted to the floor or not, as required; 3, a circular crown-plate; and 4, 4, 4, pillars or connecting stays between the base and crown-plates 2 and 3, and constituting, together with these parts, the stationary framework; 5 is a vertical shaft, carrying a conical drum with straight or spiral feeders or carriers 6 6; 7 is the foot of the shaft working in a weighbridge 7^a (for which a lever arrangement may be substituted), and 8 the top bearing of the shaft; 9, 9, 9, are revolving beaters, cased inside, placed at regular intervals around the conical drum, and set in motion by suitable gearing; 10 is an adjusting screw, to raise or lower the end of the weighbridge or lever 7^a, and by that means vary the distance between the drum and the revolving beaters; 12 is the feed-board for supplying the grain to be threshed. The front beaters, or those immediately under the feed-board, are of less length than those around the other parts of the machine. 13, 13 are gratings or plates between the beaters, to prevent the straw being carried round by them; 14 is a casing enclosing the beaters and drum; 15 is a space left between the floor and base-plate, to admit of the straw and threshed grain being removed; 6^1 6^1 are sweepers, by which the straw and grain are removed from under the drum. These sweepers may have fans attached to them, so as to blow off or separate the chaff when required. 16 is a driving-pulley, by which motion is communicated to the working parts of the machine. The arrows in the figures indicate the course taken by the straw, and the direction of revolution of the beaters.

The action of the machine is as follows:—The drum and beaters being in a state of motion, the grain to be threshed is placed on the feed-board 12, and the ends of the straw containing the same presented to be laid hold of by the carriers 6 6; the revolution of the drum causes the ears of grain, by centrifugal force, to be brought in contact with the revolving beaters, and the grain is thereby threshed out, and falls on the barn-floor under the drum, from which it is cleared away by the sweepers 6^1 6^1. Now as the drum is of a conical form, the diameter of the upper end being about half that of the base, it follows that the surface speed of the latter is double that of the former. Thus, if the conical drum is two feet diameter at the upper end, and four feet at the base, and the shaft revolves about 1,000 times per minute, the small end of the drum will travel about 6,000 feet per minute, the large end 12,000 feet, and the centre part 9,000 feet; or thereabouts, which latter will represent also the velocity of the beaters. The corn will thus, in passing through the machine, be subjected to a varying degree of separating or threshing effect, increasing gradually with the emptiness of the ears and the difficulty of dislodging the whole of the grain. The action of the beaters, too, is peculiar, as they offer no rigid resistance to the grain, and, being placed at a greater distance from the drum than heretofore in threshing-machines, they exert a species of whipping action, which effectually separates the grain without cutting, bruising, splitting, or otherwise breaking it. The revolving beaters may also be applied to other constructions of threshing-machinery than that exhibited in the engravings, with considerable advantage.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.—HODGE'S SELF-LUBRICATING AXLE-BOX.

This important invention was thus described, in a paper read before the last general meeting of the Institution of Mechanical Engineers, held at Birmingham, at which Mr. Robert Stephenson, M.P., the President, presided:

No part of the machinery of a railway requires constant lubrication more than the

axle journals of locomotives, tenders, and carriages, as the heating of one journal in the whole train is sufficient to produce the most serious results, not only in delay to the traffic, but endangering the lives of the passengers in the train.

Notwithstanding the great attention this point has received, scarcely a train that passes over our roads (in the summer more particularly), but some one or more of the axle-journals heat. In one instance the writer experienced, the whole train had to be passed into a siding for more than two hours before it could again proceed on its journey. He was induced, through what he had experienced of the difficulties attendant on the use of grease as a lubricator, and from what he knew of the use of oil in the United States, to write to the inventor of the best lubricating-box in that country, knowing that the difference of cost of lubricating was more than one-half in favour of oil, with a proper box. He obtained a patent in this country for the inventor, and on application to Mr. J. E. McConnell, of the London and North-Western Railway, a trial of the axle-box was at once made on some of their carriages.

On no railway in the United States is grease used as a lubricator; many patents have been taken out in that country for axle-boxes, but the plan now brought before the meeting seems to be preferred, and is universally adopted. The average distance that carriages run there before any additional oil is supplied to the boxes, or before the journals and brasses are examined, is 8,000 miles. This fact has been fully corroborated by the working of these boxes on the London and North-Western Railway. The first boxes were put on the tender of No. 182 engine, which was immediately put on to the most trying work, during hot weather—sometimes running express trains at the highest speeds, and at other times at the worst possible work—ballasting; and yet, after running 6,000 miles in four months, without any additional oil, the journals and brasses were in as perfect a condition as when new.

The axle-box consists of an upper chamber, which is filled full of cotton waste, flax, sponge, or any other capillary material, to retain and pass the oil up to the journal. There is also a lower or secondary chamber, for the reception of the dirty oil, which finds its way down the space at the back of the bridge wall, with a tap screw at the bottom to let it out. A covering-plate is bolted on to the front of the box, which is its only opening besides the hole for supplying oil, closed by a screw. Upon the axle a wrought-iron collar is shrunk, having a groove turned in it to receive a leather flange.

The results of the trial of the new axle-boxes in the tender No. 182, upon the London and North-Western Railway, have been officially reported as follows, to Mr. McConnell by his assistants:—"The axle-boxes have, up to 20th September last, run 5,743 miles; the bearings have been examined, and are found in a very satisfactory state. No oil has been supplied since the first day of running, four months previously: 10 quarts of oil have been supplied to the boxes altogether, and 5 quarts have been drawn off during the time from the bottom chamber, which is still good oil for screwing, drilling, and other ordinary work; the oil remaining in the boxes is considered sufficient, without more being added, to run at least from 3,000 to 4,000 miles more. The journals and brasses are wearing beautifully, with faces as though polished in the latter; and a great advantage is found, that the great wear endways does not take place on the brasses, as in the ordinary boxes using yellow grease or tallow. The cost of lubrication is greatly reduced, as appears from the following account of the comparative consumption of the above tender with the new axle-boxes, and another tender exactly similar, except that it was fitted with old boxes on Normanville's plan, using tallow, both tenders having run the same distance, 6,000 miles, under the same circumstances of trains, and the weather being dry and dusty nearly the whole of the time:

New Axle-Boxes.

	s.	d.
Oil put into the boxes at starting; 10 quarts, at 9d.	7	6
Credit by 5 quarts drawn off from the bottom chamber, at 6d.	2	6
Actual cost of oil	5	0
Cotton waste, 4 lbs., at 2d.	0	8
Leathers, 4½, at 1s.	4	6
	10	2

Actual cost per day, 1·54d., or .. .. .. 1½d. per day.

Old Axle-Boxes.

Tallow required per day, 2 lbs. at 4½d., or..	9d. per day.			
Saving per day on the six new boxes	7½d. per day.			
	cwt.	qrs.	lbs.	
Weight of the six old axle-boxes	3	1	0	
Weight of the six new axle-boxes	1	2	20	
Saving in weight of the six new boxes	1	2	8	

The advantages of this axle-box over those now in use are—

Firstly. The perfect exclusion of dirt or grit from the box, by means of the leather and wrought-iron collar.

Secondly. The certainty of constant and never-failing lubrication to the journals and brasses by means of the capillary medium placed in a separate chamber, and detached from the back of the box by means of the bridge-wall, so that the hydraulic head of the oil can be carried much higher than the joint of the leather and collar, allowing the upper chamber to be full of oil if necessary, while it is impossible that any oil can leak out at the back.

Thirdly. The provision of a secondary or under chamber for the dirty oil to drop into, from which it is drawn off, refined, and again returned to the upper chamber, or is issued in the machine-shop for drilling, cutting bolts, and many other purposes, and is equally good as new oil.

Mr. McConnell said he believed the statement in the Paper was correct about the results of the trial he had made of the axle-box. There was a perfect exclusion of dirt from the journal, and the keeping it constantly in contact with the oil was an important advantage. He was satisfied they must, ere long, abandon grease for oil; there was a great loss of power from defective lubrication of the carriage and wagon journals in cold weather, as there were no lubrication in action on first starting, until the journals got heated, and then they were liable to get too hot, and the grease ran away, and was scraped off the outside of the boxes and put in again mixed with grit at the stations. Oil was generally ready for action in any weather, and he thought Railway Companies must ultimately adopt oil for all moving journals, particularly with the present increase in the speed of trains, and the weight on the working bearings.

Mr. Lea, of London, mentioned a new material for lubrication that he was bringing into application; it had been tried some years since by Mr. Ramsbottom, with very satisfactory results; but further trials had been suspended till now, from difficulties of the inventor, who was now dead. This lubricating substance consisted of a peculiar semi-fluid composition, applicable to the present axle-boxes; oil was the basis of the composition, but thickened with India-rubber and other materials; it had an affinity for the iron bearing, which prevented the displacement of the material from the rubbing surface. The manufacture of the material was not expensive, costing only 4*d.* per lb.; and when charged at 16*d.* per lb. it had been found in the trial made that there was a very considerable saving in the cost of lubrication compared with the ordinary grease or tallow. He wished to make a further trial of it on railways, and thought it would prove an important improvement. There was a great advantage in this plan, from requiring no change in the present axle-boxes. No ordinary pressure in the bearings could squeeze out the lubricating material; therefore it remained between the surfaces, preventing contact, and consequently preventing any heating by friction.

Mr. H. Wright said, he had known several kinds of oil-boxes, but they were all liable to the spilling of the oil from side blows and oscillations. The employment of the cotton waste in the axle-box, described in the Paper, he thought was decidedly a good plan to prevent the oil from spilling over, and he inquired the result that had been found in the trial on the London and North-Western Railway?

Mr. McConnell replied, that there appeared to be no spilling or loss of oil, and the dust and grit were effectually kept out of the box. The oil drawn off from the bottom chamber was very black and thick, and not suitable to use again in that state, though it might be fit for drilling purposes, &c.; but after being properly purified, it was very good for lubrication again. There was a bridge at the back of the axle-box, just high enough to prevent the oil from flowing off; the oil did not come into contact with the leather joint, which was only to prevent the entrance of grit and dust.

Mr. Chillingworth remarked, that there

was a plan of lubrication with a cork ball, about 1 inch diameter; two of these balls floated on the surface of the oil, rolling against the journal to distribute the oil. He believed it was a French invention, but did not know the result of its application.

Mr. McConnell said he was not acquainted with that plan. The leather in the new axle-boxes was not found to wear away, and appeared likely to last a long time, as there was no pressure or strain upon it; the leather was not bent, but simply fitted easily into the groove in the iron collar, which was shrunk on to the axle.

Mr. H. Wright observed, that the leather would probably wear the iron away before it was worn away itself.

Mr. Allan remarked, that he had used sponge in the axle-boxes of engines for the last ten years, and found the results very satisfactory. They found that the consumption of oil, which was previously six to eight quarts for the 100 miles trip between Birmingham and Liverpool, was now reduced to one quart, partly by the introduction of sponge in the axle-boxes of the ten bearings of the engine and tender. The plan still continued very successful, and they had adopted it generally in their engines and tenders.

Mr. Forsyth (of Wolverton) remarked, that one circumstance had not been mentioned, in the description of the new axle-boxes tried on the London and North Western; the cotton was rammed in tolerably tight from the front, filling the boxes up solid except against the ends of the axles. The cotton was put in dry, and it became gradually saturated, by pouring in oil from time to time at the top hole; it would continue to absorb oil for several days. The surface of the cotton waste, when examined after running the 6,000 miles, was like a metallic polished surface next the journal, but still it was found saturated with oil close up to the surface of contact. The leathers were cut straight up three-quarters of an inch from the axle, but not bevelled, to get them into the groove of the iron collar, but no leakage was found to take place, as the cotton was not over-saturated, and the oil never came in contact with the leather so high up as the cut.

The Chairman proposed a vote of thanks to Mr. Hodge for his Paper, which was passed, and expressed a wish for further information about the results of trial of the axle-box.

The Meeting then adjourned; after which specimens were exhibited, by Mr. J. Mc Conochie, of Wednesbury, of a new Permanent-way Chair for Railways.

THE SMITHFIELD CLUB SHOW.—AGRICULTURAL IMPLEMENTS.

The rapid extension and increasing excellence of the manufacture of agricultural implements are evinced in the most gratifying manner by the collection exhibited in the past week at the show of the Smithfield Club. Not only were exhibitors more numerous at this great gathering of the promoters of the arts of husbandry, and the articles exhibited more numerous also, as compared with previous exhibitions, but for the most part the implements appeared to be of more substantial make, and better finish, while in some of the more prominent of them experience had evidently been at work in perfecting details. But above all, it was satisfactory to remark how universal in the agricultural community, and how earnest was the attention paid to the merits of these machines. To us, indeed, it appeared that this part of the exhibition was at least as densely crowded as the yard, and it was impossible to pass from stand to stand without being inconveniently convinced of the impenetrability of matter. In the face of these pleasing indications of intelligence and enterprise among our farmers, old-fashioned prejudices cannot long continue their existence; and with the improved prospects of agriculture which these and other great changes are hastening, they must come to look upon this class of manufacturers as their best friends.

Passing northward was the enormous space, occupying nearly half of the east side of the main gallery allotted to Messrs. W. Dray and Co., the agricultural implement manufacturers. Here also M'Cormick's and Hussey's rival reaping machines met the eye, and in one of the more western galleries, at the stand of Messrs. Crosskill and Co., of the Iron Works, Beverley, there was another rival, claiming to be the first reaping machine, invented by the Rev. Patrick Bell, in 1829. The advantage of this machine over either M'Cormick's or Hussey's, is stated to be in the fact, that it not only cuts the corn, but, by means of an endless web, revolving upon rollers, delivers the cut corn on either side of the machine, standing on its root ends. Messrs. Hornsby, of the Spittlegate Iron Works, Grantham; Smith and Co., of Stamford; Mary Wedlake and Co., of Fenchurch-street; Clayton, Shuttleworth, and Co., of Stamford; Cottam and Hallen, of Oxford-street; the City of London Portable Manure Company; Williams, of Bedford; and Barrett, Exall, and Andrews, of Reading, were amongst the other prominent contributors in this department.

The undermentioned implements were

among those which appeared to attract the most general observation.

The Northumberland Clod-crusher, manufactured by Messrs. Gibson and Son, of the St. Andrews'-works, Newcastle. This machine is distinguished by considerable simplicity of construction, and has been honoured with prizes at several of the great shows in the three kingdoms. The advantages claimed for it by its manufacturers and patentees are, that it reduces the land to fine tilth, does not clog in damp weather, leaves no small clods, does not cut the weeds, which may easily be raked off afterwards, gives to light land the degree of solidity required, fastens the young wheat after frost, and admirably prepares the ground for grass and clover seeds.

Universal Grain-mill for splitting beans, kibbling oats, and grinding barley, manufactured by John Gillett, of Brailes, near Shipston-on-Stour. This machine has two plates, and the roller is cut both ways; so that by placing grain, whether large or small, into the proper compartment of the hoppers, and turning the fly-wheel, it will perform either operation without the frequent adjusting that is required in other mills.

The Companion Subsoil Plough, of the same form, is also deserving of notice, as accomplishing two important objects simultaneously. Its first public exhibition was in September, 1852, at the Stow-in-the-Wold and Chipping Norton Agricultural Society's Show, where it seems to have attracted considerable notice. Its great advantage consists in this—that at the same time that it performs the act of ordinary ploughing, it performs the operation of subsoiling, by means of a forward share attached to the beam, and following immediately in the horses' track, which breaks up and pulverizes without turning over the soil that has been pressed by the horses' feet—thereby rendering it fit to receive the earth, which is cut and thrown over upon it by the breast, or turn-furrow.

Messrs. Dray and Co., of Swan-lane, London-bridge, in the large space allotted to them had a show of agricultural apparatus worthy of the magnitude of their operations. Amongst the articles exhibited by them were their prize reaping machine; dressing machine and blower; riddling machine; chaff and litter cutter, with three knives; patent mangle; prize sausage-chopping machine; prize American plough; turnrest plough; Sparks' steel digging fork; improved American churn (8 lbs.); Dray's improved double-action churn; treadle-grindstone and oil-cake breaker.

Messrs. Clayton, Shuttleworth, and Co., of Stamford, exhibited some choice steam engines well adapted to agricultural purposes.

Messrs. Barrett, Exall, and Andrews, of Reading, had, as usual, an extensive and excellent collection of the most recent and useful implements, substantially made, and economical in prime cost and practice.

Cottam and Hallen's Improved Draining Level.—This instrument indicates on its quadrantal arc, with comparatively little adjustment, the rise and fall in inches of every three feet in length between the spot where it is planted and that where the drain is to be brought out. The top bar of the level is brought horizontal, by placing the zero on the quadrant opposite to the brass pointer. The instrument must then be firmly fixed in the ground, to the depth of the stops, and adjusted perfectly upright by means of the plumb-line. A person is sent forward to the place where the drain is to be brought out, or in the direction of it, with a stick of the exact height of the sights in the level, which he fixes upright in the ground. The operation is then completed by looking through the eye-hole in the level, and raising or depressing the end which carries the cross wires, till they appear to cut the top of the stick.

The odometer, or land measure, manufactured by the same firm, is capable of measuring up to 20,000 yards, or nearly 11¼ miles, without being reset. The travelling wheel has six spokes, which divide the circumference into feet, so that should the instrument stop at any point when the square spoke does not come between the handles, the number of feet towards the next two yards may be ascertained.

The assortment of agricultural machines exhibited by Mary Wedlake, and Co., of Fenchurch-street, was less remarkable for its extent than for the judiciousness of its selection, and the general excellence of the articles. Great attention was directed to the "Utilitarian," registered by this firm in April last, and by which the operations of straw-cutting and oat-bruising may be performed either conjointly or separately, as may be desired. This machine is capable of cutting from 10 to 15 bushels of chaff per hour, and of bruising from two to three bushels of oats.

Mr. Williams, of Bedford, exhibited amongst other machines one for making Draining-pipes and Tiles, which is moveable, and can be efficiently worked by one man. In point of principle it is substantially the same as that exhibited at the Northampton Meeting in 1847, but great improvements have been introduced into it by Mr. Williams, in strengthening the working parts, so as to

prevent leakage, and in making it all of iron, excluding wood altogether. The operation of the machine is very good; and the moulded articles take the form of the dies with the greatest precision. The capacity of the box containing the clay is 1,450 cubic inches, and this quantity admits of an almost indefinite extension into tube. A low price, and economy of working, in addition to its other practical advantages, are certain to recommend this machine very generally.

Another useful implement of Mr. Williams' is his Patent Horse-rake. The improvement in this implement consists, first, in the construction of the teeth fitting into iron sockets, and working on the front rod, so that one or more teeth can be removed at pleasure. Secondly, the teeth acting on a bar running parallel underneath the frame, gives it greater facility in relieving it of its load. Thirdly, a ball working with the leverage of a handle keeps the teeth at their work, and is connected with the bar running underneath by a spring, and cannot lose the yealm. It is simple in construction, and cannot get out of order.

Mr. Freeman Roe, of the Strand, had an excellent collection of his liquid-manure and other pumps. His hydraulic rams, also, excited a good deal of attention, by their extreme compactness.

Messrs. John James and Co., of Leadenhall-street and Whitechapel-road, exhibited some of their weighing machines, which were highly appreciated. These machines have been honoured with the patronage of his Royal Highness Prince Albert, the Board of Ordnance, the Imperial Ministry of Russia, the Royal Agricultural Society, the Government of Brazil, and the London Dock Company. The forms of the machine for weighing oxen, loaded carts, farm produce, casks, sheep, and pigs, attracted especial attention. The same firm also exhibited specimens of their weigh-bridges, cranes, and crakes, and a good collection of sheaves and blocks.

The broad-cast manure distributor, manufactured by Messrs. Garrett and Sons, of Saxmundham. This article was registered in the month of July last, and received a prize at the recent meeting of the Royal Agricultural Society at Lewes. Its intention is that of distributing regularly all kinds of natural and artificial manures, even the most difficult ones used as top-dressing, such as nitrate of soda, salt, guano, and soot. The manure is delivered from the box by means of a barrel of novel construction, consisting of a shaft fitted with prongs, which carry over the manure, and in doing so, comes in contact with a series of scrapers which rise with and clean the barrel as it rotates, without the aid of brushes, sweepers, or any other perishable material; from whence it passes down the shoot or conductor, and is evenly distributed all over the surface, or in three or more rows. The shoots or conductors are furnished with wire rods, fixed in alternate lines, giving them the effect of a sieve, whereby the manure is separated and pulverized as it falls.

These gentlemen also exhibited a reaping machine on Hussey's construction, with their registered improvements.

Mr. George Stacey, of the Iron-works, Uxbridge, exhibited amongst his other articles, the "patent British reaping and mowing machine." In this arrangement, the corn, as it is cut, is received on a self-acting travelling apparatus, and by a cradle at the side of the machine it is divided and laid upon the ground, quite out of the returning track of the horses. The whole of the receiving and delivering apparatus may be removed in a few minutes, and the machine may then be used to cut green crops. It is made almost entirely of wrought iron, and the construction and principle are simple. It is not liable to get out of repair, and combines strength and durability with a light and neat appearance. It is worked by two horses, and one man or lad to sit on the machine to drive them. In cutting clover, grass, &c., the back part or delivering apparatus is taken away, leaving only the knives; the knife-bar is then lowered so as to cut closer to the ground, and the machine may be put in operation immediately. It passes under the crop, cutting it and clearing it over the knife-bar in almost the same position as it was.

Urwin's Patent Lift and Force-Pump, manufactured by Messrs. Burgess and Key, of Newgate-street.—This apparatus is peculiarly adapted to the pumping up and distribution of liquid manures, or other thick fluids. In the ordinary forms of the common pump, the valves are subject to become deranged and clogged, and they are so placed, that to put them in order again, the pump must be taken to pieces—an operation which occupies much time, and requires a skilful mechanic. In this pump, the valves are placed so that they can be taken out and replaced again, if necessary, in a few minutes, by any farm labourer. It is not at all liable to derangement; straw, shavings, tow, and even small chips of wood can pass through without impeding its action; and, generally, it is so simple, that it is within the management of any labourer. It is made of various sizes; but one with 4-inch barrel is recommended for manure. It is, of course, equally well

adapted for water, and, in case of fire, can be used as a fire-engine with immense effect: 4,000 gallons per hour can be pumped by it, and if worked by two men, it will throw 40 feet high.

Messrs. Holmes and Sons, of Norwich, exhibited a 6-horse moveable steam engine, for agricultural purposes, of very superior manufacture. They also exhibited a large machine which combines the operations of threshing, shaking, riddling, and winnowing, and was distinguished at the Exhibition, as well as in several trials of the Royal Agricultural Society. The combination of the three machines has been well managed, and will effect a great saving of manual labour,—a very small amount of power only being required to do the extra work. A 6-horse power engine, with one of these machines, will thresh and clean 60 to 65 quarters of mown wheat in ten hours. Barley threshed by these machines is uninjured for malting.

In combining these machines, the makers have very much simplified and lessened the number of wearing parts. The vibrating trough riddles are worked from the straw-shaker, and not from any extra spindle and strap.

Messrs. Tuxford and Sons, of the Boston and Skirbeck Iron-works, Lincolnshire, had a very beautiful fixed steam-engine, admirably adapted for general farm purposes.

Coleman's patent expanding harrow, made by R. Coleman, of Chelmsford, attracted a good deal of attention from the fewness of its parts, considering the objects it accomplishes. It combines at once a wide or narrow, coarse or fine harrow, either of which may be obtained in an instant, at the will of the workman, simply by altering the place of the hooks in the two longest chains, thus obviating the necessity of so large a variety of harrows. Being constructed on the principle of a parallel ruler, the tines always retain their relative distances from each other with mathematical exactness, at whatever width the implement is worked, so that whether the chains are so placed as to work the tines three inches apart, or one inch apart, or any intermediate distance, every tine draws a distinct line.

Messrs. Richmond and Chandler, of Salford, Manchester, especially distinguished themselves in chaff-cutting machines, for the manufacture of which they stand deservedly high. Their new machine does the same amount of work, with much less power, in the same time, than most machines of the kind, thereby reducing the expense of this important operation. Choking in the feed—an evil to which the best of these machines has hitherto been more or less liable—is scarcely possible, from the form of the toothed rollers. This machine also has a useful appendage for sharpening the knives, by merely turning two screws, and giving the fly-wheel a few turns backwards.

RAIN-GAUGE OBSERVATIONS.

The following account of the quantity of rain observed to have fallen at Greenwich at various times during the present year, was communicated to the Editor of the *Times* by Mr. J. H. Belville, of Hyde-Vale, Greenwich:

In May last 2.25 inches only of rain fell; in June 4·76 inches—greater than registered for many years: in the month of July 2·22 inches in one great thunderstorm; in August 4·55 inches; September gave 4·00 inches; again in October we had 4·18 in.: and last month (Nov.) the extraordinary depth of 6·08 making a total depth of water on the surface of the earth above 28 inches, or 2 feet 4 inches. Since the year 1800 so much rain in this locality has never been registered.

INSTITUTION OF CIVIL ENGINEERS.—THE DRAINAGE OF TOWNS.

On Tuesday evening, the discussion was resumed on Mr. Rawlinson's paper, "On the Drainage of Towns," and was extended to such a length as to preclude the reading of any paper. It was assumed, that the object of the discussion was, not to determine whether large sewers were superior or inferior to pipe-drains, but to consider the broad question of the most efficient system of drainage for towns, to ascertain the value of the general maxims that had been laid down, and the influence they might have on the sanitary condition of the country. In doing this, any allusion to public boards would be only made, by quoting from their published documents, and to the extent only of the opinions they had broached, in their public capacity. It was argued, that where by any operations of man the natural outfall had been altered, it became necessary to provide a free subterranean, or other competent outlet for the rain-fall, and thus the original destination of sewers had been only for carrying away storm-waters. The addition of house drainage was a modern refinement on the system, and it became necessary either to combine both in one comprehensive system, or to have two separate means of conveying away the rain-fall and the foul house water, &c. It was then contended, that as main arteries, brick sewers possessed direct and collateral advantages over any other mode of construction, and that small

pipes were chiefly useful as feeders, and could not prudently be extended beyond connections between houses, courts, and the main recipient sewer. The simple conclusion appeared to be, that small pipes were useful in houses, and for short distances, but not useful as part of an arterial system of drainage; that the sizes of drains must be regulated by attention to all the conditions which might arise, and they should be such as to convey away, with sufficient rapidity, all the foul house drainage and the ordinary rain-fall.

Some speakers contended that, at Richmond, at Rugby, and other places, the system of small pipe sewerage had been eminently successful; but others contended that the number of houses hitherto connected with the main sewer was very small, that the construction of the works had been so recent, as not to afford practical experience of their permanent efficiency, and yet that stoppages had repeatedly occurred, and the amount of breakage had been considerable. Also, that these recent operations, in small places, did not afford data for the construction of sewerage works applicable to the very different conditions and circumstances of important cities and populous towns.

At the monthly ballot the following candidates were duly elected:—Messrs. J. Brunlees, M. Gallez, and J. Willet, as members; and Messrs. J. Boyd, C. J. Brydges, P. H. Boutigny (d'Evreux), R. R. Ellicombe, W. Hawes, C. C. Hobbs, W. Jackson, M.P., J. James, J. Jopling, jun., W. M'Cormick; J. Warner and W. Watson, as associates.

It was announced that the discussion on Mr. Rawlinson's paper "On the Drainage of Towns" would be resumed at the meeting of Tuesday, December 14, but that it could not be prolonged beyond that evening.

SOCIETY OF ARTS.

The third ordinary meeting of the Society of Arts was held on Wednesday evening, at the Society's house in the Adelphi; Mr. John Scott Russell, Vice-President, in the chair.

Mr. Wyndham Harding, in the unavoidable absence, from indisposition, of Mr. D. R. Hay, F.R.S.E., read a highly interesting paper by that gentleman, "On the natural principles of Beauty, as developed in the Human Figure." It began by remarking that, among the philosophers of every age who had studied the principles of beauty in art and nature, there was a wonderful consistency of view; namely, that the principles of beauty in form consisted in the mode of applying and combining certain simple elementary, geometrical figures, and in attending to certain simple numerical ratios. In that doctrine lay the key to the power of modelling figures of unfading beauty which the ancients possessed, and the ancient Greeks in particular, and which the moderns did not possess. The author's theory of the beautiful was, that a figure pleased the eye in proportion as its geometrical angles bore a simple ratio to each other, just as the vibration of different notes in a consonant chord of music gratified the ear. He contended that the principles which governed beauty, like those which regulated fitness and strength, were perfect in themselves, but each individual of the human species involved some variation from a perfect development, which led some writers to doubt that there was any definite law of beauty. The lecturer referred to the Venus de Medici, and to the eastern portico of the Parthenon, in illustration of his theory; and contended that so certainly did the true principle of beauty in the human form depend upon geometrical grounds, that, by assuming a simple vertical line to represent the full height of a person, whether male or female, and whatever that height might be, he would draw a human figure, in all its exact proportions, solely by the aid of certain harmonious angles, and a cognate or correlative system of curved lines. Everybody admitted the statue of Venus to represent a perfect woman; and a minute measurement of that statue proved the truth of the theory he had laid down.

At the conclusion of the lecture an interesting discussion arose, in which Dr. Wampen, Mr. Weigall, Mr. Roberts, and the Chairman took part.

Mr. Weigall contended that one of the representations of the human form used in the lecture, and drawn after Mr. Hay's theory, proved the fallacy of that theory, inasmuch as the arm was so short, that it would not reach to the bottom of an ordinary breeches pocket. (This sally caused great laughter.)

Dr. Wampen, who has devoted a great part of his life to this particular study, stated, in effect, that the result of his experience was that beauty of symmetry in the human form depended on geometrical data to an extent which had often surprised him.

The Chairman argued, at some length, that it was to the great attention which the ancient Greeks paid—first, to the study of geometry and anatomy, and next, to the development of grace and vigour in the human form, by means of their athletic games and exercises, that their superiority in the art of sculpture was attributable; and the true wisdom of the sculptors of

the present day would lie, not so much in copying the works of ancient art, as in studying and applying, like the Greeks, the principles in which the idea of the beautiful resided.

The discussion was adjourned till a future day, and the proceedings terminated with a vote of thanks to Mr. Hay for his interesting lecture.

SOIREE OF THE LEEDS MECHANICS' INSTITUTION.

The Annual Soirée of the Leeds Mechanics' Institution and Literary Society took place on Wednesday evening, in the Music-hall, Albion-street. The announcement that Lord John Russell had consented to preside, invested the meeting with peculiar interest, and the greatest anxiety was displayed by the members of the Institution, and by the inhabitants of the town and neighbourhood, to give a hearty welcome to the noble ex-Premier on this his Lordship's first visit to the town of Leeds, although, some forty years ago, he made a tour through the neighbouring districts.

The doors of the Hall were opened at five o'clock; and, although it had been announced that the chair would not be taken until seven, every seat in the body of the room and in the galleries (which were appropriated to ladies) was occupied before six, and when the proceedings commenced the Hall was completely crammed. Precisely at seven o'clock Lord John Russell, accompanied by Mr. James Kitson, the President of the Mechanics' Institution, Mr. M. T. Baines, M.P., Sir G. Goodman, M.P., the Mayor of Leeds, &c., entered the Hall. The noble Lord's reception was most enthusiastic, and the cheering, which was repeatedly renewed, continued for some minutes. The admirable address of the noble Lord to the company present was listened to with the greatest pleasure and attention, and we much regret that the pressure on our pages should oblige us to condense it very considerably.

Lord J. Russell was received with enthusiastic applause; the great body of the Company rose, and the cheering and waving of handkerchiefs continued for some moments. When the plaudits had subsided, the noble Lord addressed the Meeting as follows:—Ladies and Gentlemen, your excellent President having conveyed to me a wish that I should preside at this meeting of the Leeds Mechanics' Institution, I had great pleasure in complying with his request; for, since the first establishment of mechanics' institutes, I have had the greatest satisfaction in seeing how much they have contributed to the instruction of those who belong to them, and to the general knowledge and to the general welfare of the country. I had the pleasure of assisting Dr. Birkbeck in the beginning of these institutions. It occurs to me that if I can address anything to you worthy of observation, it should be upon the general state of knowledge at this time, and the prospect of what is before us. It was Lord Bacon who first pointed out that the mode of the pursuit of science for modern nations ought to be different from that mode for the discovery which had been pointed out by some of the great philosophers. It has been much questioned whether Lord Bacon was in fact the guide by whom other discoverers have been enabled to pursue the track of knowledge and of invention, and upon that point I think it is certainly clear that it was not Lord Bacon who enabled Galileo and Torricelli, Pascal, Tycho Brahe, Copernicus, and Kepler to make the great discoveries which have immortalised their names. But what is true is, that Lord Bacon at a very early period laid down the rules by which all modern men of science have guided themselves. He pointed out the road they had followed, and laid down more clearly, more broadly, more ably than any one else, the great method by which modern discovery should be pursued. (Cheers.) You will find, I think, if you pursue this subject—if those who belong to mechanics' institutes will study the two works of Lord Bacon, the one called the "New Organ," and the other on the "Instauration of the Sciences," you will find that the latest discoveries, the latest inventions, have been made according to that mode which he pointed out. A work was published about a year ago by Mr. Fairbairn, giving an account of the experiments which he adopted under the direction of Mr. Stephenson, and by which that gentleman was enabled to construct the tubular bridges at Conway and over the Menai Straits. You will find that all those experiments were according to the rules which Lord Bacon has laid down. (Hear.) Take another work on geology, and a most interesting work it is, called the "Old Red Sandstone," by Mr. Hugh Miller, and you will find in that interesting work, which is as remarkable for the beauty of its style as for the importance of its matter, that Mr. Hugh Miller, being at first a mason working in a stone quarry, pursued, in his method of investigation, the same rules which Lord Bacon, more than three centuries ago, laid down, and which have thus become the foundation of the law, as it were, of modern science.

There is a very beautiful ode of Horace, in

which, exalting the merits of poetry, he says that many brave men lived before Agamemnon; that there were many great sieges before the siege of Troy; that before Achilles and Hector existed there were brave men and great battles; but that as they had no poet, they died, and that it required the genius of poetry to give immortal existence to the bravery of armies and of chiefs. (Hear, hear.) Pope has copied this ode of Horace, and in some respects has well copied and imitated it in some lines which certainly are worthy of admiration, beginning—

> "Lest you should think that verse shall die,
> Which sounds the silver Thames along."

But in the instances which he gives he mentions Newton, and says that not only brave men had lived and fought, but that other Newtons "systems framed." Now, here he has not kept to the merit and truth of his original; for, though it may be quite true that there were distinguished armies and wonderful sieges, and that their memory has passed into oblivion, it is not at all probable that any man like Newton followed by mathematical roads the line of discovery, and that those great truths which he discovered should have perished and fallen into oblivion.

It will be for you, when we retire from the more active business of this scene, to endeavour to carry on to still greater knowledge, to still more comfort, to still greater well-being, the country in which you live. There is a great charge imposed upon you, and I trust you will properly perform it. Let no insane passion carry you, without reason, into contests with foreign countries. (Loud and continued cheering.) Let no unworthy prejudices induce you to withhold from any part of your countrymen that which is their due. (Renewed cheers.) Let no previous convictions prevent you from examining every subject with impartial eyes, and from placing before you the light of truth, which ought to guide you in your investigations. (Hear, hear.) With these convictions I am persuaded you will abide by the Institutions which you have, by the faith which you hold, and that you will adorn the country to which you belong. (Loud and prolonged cheering.)

The company were afterwards addressed by Mr. Baines, M.P., Mr. Cole, Professor Phillips, Lord Beaumont, the Dean of Ripon, the Rev. C. Wicksteed (President of the Leeds Philosophical and Literary Society), Mr. H. Pease (President of the Darlington Mechanics' Institute), Sir G. Goodman, M.P., Mr. G. Cruickshank, and the Mayor. Several sentiments appropriate to the occasion were passed, and the proceedings were looked upon as most gratifying.

On the following day, the Mayor, Aldermen, and Common Council of the borough presented an Address to the noble Lord.

THE SEWAGE GUANO COMPANY.

Among the now happily few subjects which continue to resist the onward tendencies of improvement, that of the sewage question must be assigned the unenviable distinction of holding a prominent place. Science and the ingenuity of inventors have done their work in devising general processes, and supplying the details for carrying them on efficiently and economically—even remuneratively,—and the energies of the benevolent have been ready to encourage these useful labours. The great drag upon progress in this most important point of our social organization—the great restraint upon the pent-up desires of the multitude, and the genius of their leaders in this movement of modern civilization—has come from a quarter which was especially constituted to aid and promote it, and from which our population had expected, at least, a moderate realization of their hopes. It is now time we should see that useful and practical method should no longer be prevented by mere official obstructions from being carried into operation.

Fully two years ago, we witnessed an experiment on a large scale, first upon the sewage of the Northumberland-street sewer, and then upon that of the Essex-street sewer, conducted most successfully on the principles enunciated in the patent since obtained by Mr. Richard Dover, which is the basis of the operations of the above society. Nothing can be more simple or obvious than the plan it proposes to work upon in practice. The contents of a sewer at any convenient point are diverted by a dam, revolving bulk-head, or partition, capable of falling down when a greater hydrostatic pressure is exerted against it than that which would be produced by a high tide, so that there can be no danger of an overflow. They then fall into a well or cistern, whence they are pumped into a series of tanks by means of a steam-engine, the fluid filling them successively. Here the disinfecting agent does its work, the residuum is collected at the works, and the floating fluid escapes into the river, deprived of all those impurities which at present render it a source of disease. If the sewer be a large one, several of these works may be constructed upon it, and in that case the channels will be so constructed as to carry off from the first works the fluid which it can-

not act upon, and send it to the second. From the second the excess would flow to the third, and so on, until it would finally enter the river.

Much may be said upon the process at its several stages, but it will be sufficient now to observe that the experiments were conclusive upon the correctness of the principle; while, as to the efficiency of the manure thus produced, it has been tried with the most complete success in various parts of the country and by various agriculturalists. The Sewage Guano Company have now had their arrangements brought to some degree of maturity; and we have endeavoured, though without obtaining any satisfactory intelligence on the subject, to ascertain what they have already done. Our misgivings of the earnestness of the Sewer Commissioners are prompt to suggest to us the cause of this inaction. We shall be glad to learn hereafter that we have been mistaken; but either there is some sinister interference of this kind, or the pretensions of this promising process have been most unwarrantably overrated. Fully convinced that much lies in this point of the utmost importance to the public, we look forward with some degree of eagerness to the immediate operations of the Company.

THE DOVER SUBTERRANEAN TELEGRAPH

Some few weeks since a serious disturbance took place in the vicinity of Canterbury, in laying down the wires of the Subterranean Electric Telegraph, under the level crossing of the South-Eastern Railway, at St. Dunstan's. Just as the contractor's men were about to proceed, the servants of the Railway Company attached to this station, interposed, and demanded a cessation of the works. The compliance with this request, however, would have involved much delay and unnecessary expense in laying down the telegraph, as its connection with the subterranean cable was to be accomplished at a certain period and near date, and remonstrances at the time failing, it was determined to proceed with the operations, despite the command of the railway officials, more especially as they had already gone over one of the Company's lines, the North Kent, near Gravesend, without meeting with any obstacle, and that in this instance they had given notice of their intention, and had made the necessary arrangements to secure the public safety. As soon as the operations were re-commenced, a serious disturbance ensued, and, but for the timely attendance of the mayor, and other authorities, a riot of rather a formidable character might have occurred. An investigation at the city police-court took place, when the railway servants were recommended to allow the works to proceed. Eventually the telegraph was continued along the road to Dover, and attached to the wires across the Channel; but it would seem that it is not to be allowed to continue its working without some trying opposition. The South-Eastern Railway have just issued a notice requesting its removal from the course which it at present takes. The order is to the following effect:

"To the European and American Electric Printing Telegraph Company, and the Secretary, and also Alfred Blackburne Frend, and other Agents and Contractors of the same Company.

"South-Eastern Railway
"Terminus, London-bridge."

"I hereby, on behalf of the South-Eastern Railway Company, give you and each of you notice, that the laying down of the wires of your Company, your contractors, agents, and servants, under the rails and line of the South-Eastern Railway Company, in the parish of St. Dunstan's, Canterbury, is a trespass on the part of the Telegraph Company, their contractors, agents, and servants therein engaged; and I hereby require you forthwith to remove the wires and works connected therewith from under the said railway. And I am further to give you notice, that unless the same be forthwith removed, such proceedings will be taken against the Telegraph Company, their contractors, agents, and servants, by and on the part of the South-Eastern Railway Company, as they may be advised.

"I am, Gentlemen, yours, &c.,
(Signed) "C. S. HERBERT."

The question at issue has created much sensation in the neighbourhood, and it is hoped that whatever measure it may be deemed advisable to adopt, care will be taken to avoid anything which may give rise to disorder. If the subterranean telegraph is not allowed to pass under the line, the difficulty is how it is to be worked to Dover.

BLASTING OF THE SWELLY ROCKS IN THE MENAI STRAITS.

In compliance with the statement made by the Secretary of the Admiralty to Mr. Bulkeley Hughes, in the House of Commons on Tuesday last, instructions have been received from the Admiralty authorities for the immediate removal of these dangerous obstructions to the due navigation of the Menai. Mr. Edwin Clark has been appointed to conduct the undertaking, and he is now engaged in preparing the

necessary plans, not only for the blasting of the rocks, but for other improvements in the navigation of the straits in the neighbourhood of the bridges. It is thought the blasting will be let to a number of local contractors, and that tenders will be immediately published.

ELEMENTS OF MR. HIND'S PLANET.

Mr. J. R. Hind, in a letter dated on the 8th inst., communicated to the *Times* the elements of the orbit of the small planet which he discovered on the 16th of November. They have been calculated by M. Vogel, assistant at Mr. Bishop's Observatory, Regent's-park, and are as follow:

	d.	m.	s.
Mean anomally, counted from perihelion on November 30, at Greenwich, noon	22	27	0
Longitude of the perihelion	46	13	29
Longitude of ascending node	66	53	6
Inclination to the ecliptic	14	20	13

Mean distance from the sun...2·9412
Eccentricity ... ...0·10458

"For this early knowledge of the planet's orbit we are mainly indebted to the observations of Mr. Hartnup, of Liverpool, and it is only one of many instances where astronomy has benefited by the establishment of the fine Observatory in that town, which is supported by the enlightened liberality of the corporation. In London I have not had an opportunity of seeing the planet since the 19th ult.

"Mr. Adams having undertaken, at Mr. Bishop's request, to select a name for this our seventh planet, proposes to call it 'Calliope.' The discovery was not fully verified, owing to the cloudy state of the atmosphere, until the night of November 17, or early on the following morning. Calliope, whose office in ancient mythology required her to perpetuate the illustrious deeds of heroes, can hardly fail to remind us of the event of the 18th, when the homage of so many nations was paid to the memory of the greatest hero of modern times."

EXTENSION OF STEAM NAVIGATION.

At the first half-yearly meeting of the North of Europe Steam Navigation Company, held the day before yesterday, at the London Tavern, the Earl of Yarborough, Chairman of the Company, in the Chair, a report of a very important and interesting character was submitted to and adopted by the shareholders, representing the nature and prospects of the great system of screw steam navigation already commenced by this Company between Grimsby, Lowestoft, and Harwich, the principal ports of northern Europe.

The substance of this Report will be found highly interesting, as well as instructive, on the subject of these great commercial and international interests:

We proceed to detail the routes of traffic now opened, with the present ships of the Company; those it is desirable at once to open; and the means required to accomplish this end:

First. Between Great Grimsby and Hamburg; the *Hamburg* and *Leipsig* are running, one from each place, weekly.

The exports and imports of the Humber are known to be very large; among other important items, we may mention the export of 61,565 tons of coal, 64,953 bales of cotton twist, 116,809 bales of cotton wool, 23,239 packages of cotton manufactured goods, &c., as well as upwards of 35,000 tons of iron and steel, manufactured and unmanufactured.

Its imports include 797,744 quarters of grain and pulse, 30,235 bales of wool, 19,952 standard hundred of deals, &c.; of these, the imports and exports of Hamburg embrace a very large portion. With the great accommodation afforded by the new docks at Great Grimsby, and their immediate communication by rail, not only with the whole of the manufacturing districts, but with the metropolis, it may reasonably be supposed that these two ships will be insufficient, in the ensuing spring; and it will therefore be necessary to place two other ships upon this line, so as to perform journeys twice weekly; and, by adopting a system of through booking, and affording every accommodation to passengers, we have full confidence of securing a very large trade.

Secondly. It is also desirable to establish a communication between Great Grimsby and Rotterdam, and to run at least once weekly. One of the present ships of the Company will be placed upon this route.

Thirdly. The trade with Denmark *viâ* Lowestoft is one altogether new.

The repeal of the Import Duties on cattle opened a new era in the import trade of this country, which has been greatly aided by the increased means at the disposal of the working classes for the purchase of animal food. The farmers and graziers of Schleswig, Holstein, and Jütland, on whose rich marshes upwards of 40,000 head of cattle are fatted and exported annually, naturally turned their attention to the English market. A trial was made in 1848, with questionable success, on account of the inferior character of the steamers employed; for it has taken experience to establish what common sense should at first have dictated—that to carry a cargo of live cattle, with perfect safety and expedition, across the German Ocean in all weathers, would require the best and steadiest ships that could possibly be procured. But a commencement once made was soon

improved upon. In 1850 upwards of 8,000 head were exported from Tönning to London. In 1851 it had increased to 12,000; and this year, from June to November, nearly 20,000 head of oxen had been exported from that port to London.

Of these oxen (as before stated) no less than 10,742 had been brought by the ships of the Northern Steam-Packet Company into Lowestoft, and conveyed by rail to London, for the Smithfield market.

When it is considered that 20,000 oxen will be 100 freights for large steamers—that it is of the last importance they should be conveyed in the least possible time by the nearest sea voyage, and in the shortest space, and if so conveyed must always secure a remunerative freight—this *alone* forms the nucleus of a very large and permanent trade. The proof of which is, that the *City of Norwich* (a ship built expressly for this trade by the Northern Steam Packet Company) has, in fifteen weeks, performed fifteen voyages to Tönning and back, bringing near 4,000 head of oxen, and as many sheep, without the loss of a single head!

A glance at the map of Denmark will show that the extensive peninsula of Schleswig and Jütland is only thirty-five miles across, between the important port of Tönning on the Eider, and the equally important port of Flensburg on the Baltic. Across this isthmus, Mr. Peto, the Deputy-chairman, obtained, this summer, a full concession from the King of Denmark to make a line of railroad without restriction. Since then the line has been surveyed, the work has actually been commenced, and it is fully expected that a large portion will be open for traffic by the autumn of next year.

When we consider that this short link will connect the Baltic with the German Ocean—that it will place the important capital of Copenhagen within forty-eight hours of London—that it will open the door to the Baltic Sea, without enduring the lengthened, dangerous, and intricate navigation of the Sound and Belt—that it will, in short, save 300 miles of sea voyage to Copenhagen, 500 to Flensburg and the southern parts of Denmark, as well as be a shorter and safer route to Sweden, Stettin, Riga, St. Petersburg, and every part of the Baltic—its advantages cannot be overrated. It is, in fact, as important to these countries as a railway across the Isthmus of Suez is to India, or that of Panama to the western coast of America and the Pacific.

The port of Flensburg is one of the finest and safest in the world: already its trade is of considerable extent, not only coastways, and to various ports of the Baltic, but also to the West Indies, the intercourse with which is greatly retarded by the long and tedious navigation of the Cattegat and Belts, but which the connection by rail with Tönning will obviate, and enable their vessels to perform two voyages to one.

Simultaneously with this, the proprietors of the Copenhagen and Roeskilde Railway have determined to continue their line to Korsoer, a port on the west coast of Zealand, and only sixty-five miles from Flensburg, thereby opening the richest and most important island of Denmark, as well as the capital, by an easy run in smooth water of five or six hours to Flensburg.

The port of Tönning being reached from London *viâ* Lowestoft in thirty hours, an easy ride of two hours will convey passengers or goods to Flensburg on the shores of the Baltic. A run of five hours by sea, and four more by rail, will reach Copenhagen—or forty-one hours, say (stoppages included) forty-four hours. This is the time now occupied, *viâ* Ostend, to reach Hamburg by rail, and only two-thirds of the average passage by sea, and less than half the average passage by any existing route to Copenhagen. And the same holds good respecting all places in the Baltic, either in Sweden, Germany, or Russia, now reached by the Cattegat and Sound.

The next route it is thought advisable to open out, in the ensuing year, is a direct and weekly communication with Norway and Sweden, by sea.

It will be seen that these countries lie too far north to avail themselves of the overland route, pointed out to Flensburg; and, as railway influence is also opening out the resources of their country, their demand for direct communication with England becomes more urgent. To encourage this, the Government of Sweden have granted the sum of 2,000*l*. per annum, for a weekly communication between this country and Gothenborg, calling, if required, at Christiansand in Norway. Although this is a very small sum, as a contract for carrying a mail, yet, as it was intended to run to those countries, it was thought more desirable to run with this bonus than without it. This contract has, therefore, been taken by your Directors for five years; and they propose, as early as possible, to construct two screw steamers, of moderate power and good capacity, in order to carry out the same in a satisfactory, as well as profitable, manner.

The traffic to Norway, especially Christiana, is already very considerable; and the opening of the railway to Lake Miösen (already partly constructed) will add materially to the same.

To Gothenborg, also, a large import of manufactures exists, and an export of iron, grain, and timber. Of these, 10,000 tons of iron, 40,000 quarters of oats, and 34,000

tons of wood, were imported into London last year.

A considerable passenger-train to Gothenborg likewise exists, it being the usual route to Stockholm, by small steamers navigating the Götha and passing through the Lakes Wenern and Wettern to Stockholm.

We must now pass to a field of enterprize and source of traffic much nearer home, but equally important and interesting.

As soon as the railway is completed to Harwich, it is intended to place vessels, with superior accommodation and of great speed, between Harwich and Rotterdam, as well as Ostend, and probably Dunkirk. They will commence by running twice weekly, which will no doubt shortly be increased to a daily communication between these places. Rotterdam will then be reached in eleven, Antwerp in twelve, and Ostend in eight hours.

The six vessels, the buildings, machinery, factory, and stores now in possession of the Company, have been purchased for 87,479*l.*; of this the cost of the two Hanseatic ships, 31,500*l.* has been paid out of the first call of 2*l.* 10*s.* per share, leaving the ships and plant of the Northern Steam-Packet Company, valued at 55,979*l.*, to be paid out of the balance of this, and a portion of the next call.

In the meantime preparations must at once be made to build the two vessels necessary for the Norway and Swedish trade, which should be ready by June, so as not to be injudiciously hurried in the construction, to the great injury both of builder and owner.

We shall also require at least two other ships for the large and increased trade to Denmark, Hamburg, and Holland, which is certain to follow next summer. No doubt on this head need for a moment be entertained, the Managing Director, Captain Andrews, having just returned from Hamburg and Denmark, where he has made arrangements for the traffic for next year, and signed an agreement with no less than four hundred and sixty-six of the principal graziers and farmers of Denmark, for the conveyance of their cattle to London, *vià* Lowestoft, the probable number of which cannot be estimated at less than 12,000 oxen and 10,000 sheep, and the amount of grain will only be limited by the capacity of the ships to carry this produce in addition to their live freight.

COURT OF EXCHEQUER.

Sittings at *nisi prius* after Michaelmas Term, before the Lord Chief Baron and a Special Jury.

TETLEY *v.* EASTON AND ANOTHER.

This case which was partly heard on Thursday last, was resumed and concluded on Friday. The action was brought by Mr. Tetley, residing at Bradford, Yorkshire, for the infringement of his patent "for certain improvements in machinery for raising and impelling water, and other liquids, and also thereby to obtain mechanical power."

Sir F. Thesiger, Mr. Atherton, and Mr Webster were counsel for the Plaintiff; Sir A. Cockburn, Mr. Hindmarch, and Mr. Grove, were for the Defendants.

The Defendants proceeded at the sitting of the Court on Friday to call witnesses, the object of whose testimony was to show that the principle of the alleged invention of the Plaintiff was substantially the same as that specified in the patent of Mr. Hale, taken out in 1832. This evidence occupied the greater part of the day, and at its termination evidence was offered in reply.

Sir A. Cockburn having replied on this new evidence,

Mr. Atherton made the general reply on the part of the Plaintiff.

The Chief Baron then proceeded to sum up the whole case to the jury, and in so doing pointed out what he conceived to be defects in the specification of the Plaintiff and left it to them to say whether Hale's patent included the principle involved in that of the Plaintiff. In other words, was Mr. Appold working on Hale's discovery, or on a different one subsequently put forward by the Plaintiff? Both the parties came before the Court free from that blame which often attached to parties engaged in patent causes; but it would be for the jury to say whether they thought that Mr. Appold's pump was or was not an infringement of the Plaintiff's patent if that differed in principle from Hale's.

The jury, after a brief deliberation, returned a verdict for the Defendants.

THE IRON TRADE.

Birmingham.—(Extract from a letter.) "If our Transatlantic and Continental friends do not know how to appreciate the worth of our Staffordshire iron, it is not because we are slow in attaching a proper value to it. As I anticipated in my last letter, another advance has taken place, contrary to all expectations,—the good old railway mania prices are fast returning, and 12*l.* per ton for rails, and no abatement, are looked forward to with pleasure. Well, be this anticipation well or ill-founded, certain it is that bars, which only two months ago did not realise more than 5*l.* 7*s.* 6*d.*, are now selling at 10*l.* per ton, and even at this enormous advance there are far more orders on the books than can be executed. There is not an old furnace

in the two adjoining counties, however defective, which is not now being set in motion to meet the demand, and all is insufficient. Should the expectations entertained by the friends of free trade, with reference to the commercial policy attributed to the Emperor of France, be realised, we may, indeed, look forward to a golden harvest for this important branch of our national industry. The most recent accounts received here from France, represent a change in the tariff of that country as already decided upon, and if so iron is to be admitted upon terms highly advantageous to this country. The prospects from America are also cheering, new lines are being constantly announced there, which will require still further efforts on our part to meet the demand. We are not, however, without our drawbacks. Coal can hardly be had at anything like a moderate price. The recent inundations have filled many of the pits, and the time of the men, which ought to be devoted to mining, is spent in pumping out the water. Add to this the weekly "turn outs," threats of turns out, advances of wages, and loss of time by the men; the production is infinitely short of the demand, and likely to be so. The last requirement of eighteen pence made by the men has taxed the patience of the masters, and how far they will accede to this demand is not yet known in this locality.

"A numerous and important meeting of iron-masters and mine-owners was held at Stourbridge on Friday last, for the purpose of considering the state of the trade, and the demand of the men. The notices given by the colliers are to expire on Monday and Tuesday next, and the question at issue is one of much importance. The result of the deliberations was kept private; but there is little doubt if the demand is not entirely acceded to, an amicable arrangement will be made. The effect of anything like a general strike now would be most injurious, not only to the iron trade, but to many other important interests which are in a satisfactory condition."

Stourbridge.—As a proof of the prosperity of this trade, and the amount of work in hand, we quote the following circular from a large manufacturing house at Stourbridge to an eminent firm in this city:—"Stourbridge, December 1, 1852.—We beg to inform you that our orders now on the books will carry us so far into our next quarter's make, that we shall be unable to accept any more for execution this quarter; all further orders with which you may favour us during the remainder of the present quarter must, therefore, be for next quarter's delivery, and subject to next quarter day's price." The advance from the 1st of September to the 1st of December has been 4*l.* per ton on all Staffordshire-made iron.—*Bristol Mercury.*

Glasgow Pig-iron Market.—Glasgow, Dec. 4.—We have just closed a week of most unprecedented excitement in our pig-iron market, the price having advanced about 6s. per ton this day se'nnight. The nominal quotation to-day is 65s. for m. n. warrants, at which considerable business has been done, the market closing with a very unsettled appearance.

America.—By the Royal Mail Steam-ship *Canada*, which arrived at Liverpool on Monday, with advices from New York to the 23rd, and from Boston to the 24th ult., we learn that in iron there had been a speculative movement on the part of a few heavy operators, by which all the Scotch pig to be had below 30 dollars was cleared, including about 1,200 tons, mostly at 28 to 29 dollars, six months, now held at 2 to 3 dollars advance. 200 tons common English are reported at 54 dollars, six months; also 120 tons Scotch pig, at 30 dollars, customary credit.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING DECEMBER 9, 1852.

Henry Webster, of Manthorpe, Lincoln, wheelwright. *For improvements in regulating the draft in chimneys or flues.* Patent dated May 25, 1852.

These improvements are effected,

1. By partially closing or contracting the flues of chimneys near the fire by means of an adjustable inclined plate, which admits of the opening being enlarged when requisite, and provides against the deflection of currents of smoke, &c., into the apartment.

2. By means of a peculiarly-shaped wind-guard, composed of two funnel-shaped portions, the lower one of which is perforated for the entrance of wind, by which the ascent of the smoke from the chimney is facilitated.

Alexander Bain, of Beevor Lodge, Hammersmith, gentleman. *For improvements in electric telegraphs and in electric clocks and time-keepers, and in apparatus connected therewith.* Patent dated 29th May, 1852.

Mr. Bain's improvements comprehend,

1. The arranging of apparatus in connection with electric telegraphs in such manner that signs or indications, after having been produced, shall continue in sight for a certain time, while the electric current that produced them is being employed in giving other signs or indications.

2. The working of telegraphic instruments in such manner that a succession of

the same or different signals may be produced without changing the direction of the current.

3. The arrangement of electric clocks or time-keepers in such manner that the clock-work or power employed to give motion to a magnet in the same, may be regulated or controlled by another system of clock-work.

RICHARD FORD STURGES, of Birmingham, manufacturer. *For certain new or improved ornamental fabrics.* Patent dated May 29, 1852.

These improved ornamental fabrics are composed of fine wire, or metallic threads, or partly of such threads, and partly of threads of fibrous material, and are produced by lace-machinery of the ordinary kind. Any kind of metallic threads may be used, and they may be subsequently gilt or silvered by the electroplating process.

Claim.—An ornamental fabric composed of wire or metallic threads, or partly of metallic threads and partly of threads of fibrous material, and produced by lace-machinery, however modified.

JOSEPH LEESE, the younger, of Manchester, calico-printer. *For an improved system of preparing, cutting, and engraving rollers to be used for printing woven and other fabrics, and improved machinery for printing and washing the same fabrics.* Patent dated May 29, 1852.

The *first* improvements consist in making printing-rollers of metal, having felt or other suitable soft material, inlaid on the parts that give the impression.

The *second* improvement consists in making printing-rollers in rings or segments fixed on an axis or mandril, and inlaid with felt, as before.

The *third* improvement consists in the manner of transferring impressions on to metal rollers, previous to cutting the same. This is done by drawing the pattern in engravers' varnish on paper, then transferring the impression to the surface of the roller, and subjecting the roller to the action of acid, so as to remove the parts not required for the pattern. This process may be varied to suit particular circumstances.

The *fourth* improvement consists in giving to the printing-roller of cylinder printing-machines a rapid vibratory or tremulous motion; or in giving the same motion to the colour-furnisher, or to the surface against which the fabric is held to receive the impression.

The *fifth* improvement consists in a mode of attaching rings or segments forming printing-rollers, to axes or mandrils of less diameter than the apertures of the rings by means of screws or wedges.

The *sixth* improvement consists of a washing-machine, in which the fabric is passed under and over rollers in separate compartments of the same trough, and is subjected in its passage to numerous jets of water.

WILLIAM ARMAND GILBEE, of South-street, Finsbury. *For certain improvements in machinery for cutting corks.* (A communication.) Patent dated June 1, 1852.

This improved machinery is distinguished mainly by the cutting-blade being in a horizontal position, and having a reciprocating movement; the pieces of cork to be cut are grasped between holders which have a rotary motion and bring every part of the cork successively to the knife. The corks may be cut either parallel-sided or tapered by varying the sizes of the holders.

WILLIAM HENRY PHILLIPS, of Camberwell New-road, engineer. *For improvements in decorative illumination, and in applying light for other purposes.* Patent dated June 1, 1852.

The improvements claimed by Mr. Phillips consists in the use of chambers having one or more devices perforated on their surfaces, and furnished with slides for bringing one or other of the same into use as required, instead of having to band pipes as is now done for every particular ornamental device. The chambers are connected by pipes with a main for supplying them with gas.

THOMAS WILLIS, of Manchester, machine-maker. *For certain improvements in machinery or apparatus for winding yarns or threads, and also improvements in looms for weaving.* Patent dated June 1, 1852.

The "improvements in apparatus for winding yarns or threads" include several arrangements for winding on to flanged and unflanged bobbins, and for the forming of pin-cops, &c.

The "improvements in looms" relate to the small ware loom, and include arrangements for governing the letting off of the warps, for actuating the healds, for working the sets of shuttles, and for taking up the finished goods.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For improvements in machinery for propelling vessels, and in apparatus to be used in connection therewith.* (A communication.) Patent dated June 1, 1852.

The patentee describes and claims:

1. A mode of arranging marine engines for driving the paddle-wheels of steam-vessels, in a line with the keel, in combination with a central beam between the open

ends of the cylinders, and suitable means for transmitting the motion of the pistons to the cranks and paddle shaft.

2. Another arrangement for the same purpose.

3. The arranging of caloric engines when used for propelling vessels within a closed chamber, which is supplied with air through suitable trunks, and furnished with an escape funnel for the vitiated air, by which means a constant supply of air is ensured, and ventilation of the engine-room at the same time provided for.

Specifications Due, but not Enrolled.

ADOLPHUS CHARLES VON HERTZ, of Cecil-street, Middlesex, Esq. *For improvements in treating, preparing, and preserving roots and plants, in extracting saccharine and other juices from roots and plants, in the treatment of such juices, and in the processes, machinery, and apparatus employed therein.* Patent dated May 29, 1852.

FREDERICK MILLER, of Fenchurch-street, London, gentleman. *For improvements in apparatus for hatching eggs.* Patent dated May 29, 1852.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated November 17, 1852.

772. Isaac Lowthian Bell. Improvements in the treatment of certain compounds of iron and sulphur.

774. John Hinchcliff and Ralph Salt. Improvements in steam engines.

776. Francis Bresson. A new and improved mode of propelling on land and water.

775. Henry Vernon Physick. Improvements in electric telegraphic apparatus, and in machinery or apparatus for constructing the same.

Dated November 19, 1852.

779. James Rock, the younger. Improvements in buffers.

780. James Potter. Improvements in machinery for spinning cotton and other fibrous substances.

781. James Hume. Improvements in water-closets.

782. John Venables Vernon and John Edge. Improvements in apparatus and machinery for engraving rollers of glass, copper, brass, and other metallic compounds.

783. George Hamilton. Improvement in spreading or distributing starch, gum, and other semi-fluid matters.

785. Peter Carmichael. Improvements in machinery for winding yarn or thread.

786. John Burgess. An improvement in dyeing wool.

787. Moses Poole. Improvements in the manufacture of seamless garments and other seamless fabrics.—A communication.

788. William Williams. Improvements in electric telegraphs.

789. George Perry Tewksbury. An improved life-preserving seat.

790. Benjamin Nickels. Improvements in the manufacture of adhesive plaster.

791. Richard Kemsley Day. Improvements in the manufacture of fuel for lighting fires.

792. Charles de Bergue. Improvements in the permanent way of railways.

793. John Robert Johnson. Improvements in the manufacture of type or raised surfaces for printing.

794. Moses Poole. Improvements in cementing matters in the production of ornamental and other forms and surfaces.—A communication.

795. Henry Bessemer. Improvements in apparatus for concentrating cane juices and other saccharine solutions, and in the treatment of such fluids.

796. Henry Bessemer. Improvements in the crystallization and manufacture of sugar.

797. Henry Bessemer. Improvements in the treatment of washed or cleansed sugar.

798. Jean Joseph Jules Pierrard. Improvements in preparing wool and other fibrous substances for combing.

799. Henry Bessemer. Improvements in apparatus for concentrating saccharine fluids.

Dated November 20, 1852.

800. Richard Taylor. Improvements in heating dye-cisterns and soap-cisterns, used in the process of calico printing.

801. John Trestrail. Improvements in raising sunken vessels or other materials from under the water or in the sea, or to prevent them from sinking.

802. John Brettell Collins. A new improved flooring cramp or lifting jack.

803. James Nasmyth. Certain improvements in machinery or apparatus for packing and compressing cotton, wool, and other substances.

804. Thomas Ellis, senr. An improvement or improvements in constructing a metallic band or bands for raising and lowering heavy weights, and other like purposes.

805. Joseph Edwards. An improved envelope, and the means of affording additional security to the same.

806. William Dray. Improvements in machinery for crushing, bruising, and pulverizing.

807. Charles Goty. Improvements in pumps for raising and forcing liquids.

808. George Wilson. An improved manufacture of glass bottles and jars.

809. William Green. Improvements in the manufacture of textile fabrics, and in machinery or apparatus for effecting the same, parts of which improvements are also applicable to printing and embossing generally.

Dated November 22, 1852.

810. Edwin Bates. The revolver, a perfect self-righting whale-fishing, pilot, or other boat, to be called "Bates' Life-Boat." (No. 1 of a series of naval architecture.)

811. Benjamin Walker and William Bestwick. Improvements in the manufacture of braid and the machinery or apparatus employed therein.

812. William Crosskill. Improvements in clod-crushers, or rollers for rolling, crushing, or pressing land.

813. John Weems. Improvements in obtaining motive power.

814. Robert Heggie. Improvements in railway brakes.

815. John Wheely Lea and William Hunt. Improvements in the manufacture of iron.

816. William Edward Newton. Improvements in the manufacture of paper.—A communication.

817. John Pepper, junior. A new or improved machine for knitting ribbed work.

818. William Hedges. Improvements in carriages.

819. James Reese. Improvements in the manufacture of welded iron tubes.
820. Samuel Hunter. Improvements in anchors.
821. Joseph Blain. A new system of corking.

Dated November 23, 1852.

822. George Eade. A surface-and-subaqueous floating breakwater.
824. John Winter. Improvements in the mode of combining bars of iron so as to form larger masses or pieces of iron applicable in the manufacture of axles, shafts, columns, beams, cannon, and other articles.
825. John Winter. Improvements in the manufacture of wheels.
826. Francis Bywater Frith. Certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, cords, beaverteens, and other similar fabrics composed of cotton, silk, wool, and other fibrous materials.
827. John Kilner. Certain improvements in the means of insulating the wires of electric telegraphs.
828. Michael Leopold Parnell. An improvement in the construction of box staples, and striking plates.
829. John Edwin Grisdale. Improvements in steering ships or vessels.
830. James Armitage and Charles Thaxter. Improvements in dies for moulding plastic materials.
831. William Edward Newton. Improvements in the construction of and method of applying brakes to railroad carriages, engines, and tenders, for the purpose of preventing collisions.—A communication.
832. John Beale. An improved arrangement of steam-engine, and an improved packing to be used therein.
833. John Frearson. Improvements in the manufacture of hooks for garments.
834. Charles Watt. Improvements in obtaining currents of electricity.
835. John Barker. Improvements in separating gold from quartz or matters containing that metal.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," Dec.* 7, 1852.)

173. Theophilus Redwood. Improvements in the manufacture of gelatine.
260. William Coles Fuller and George Morris Knevitt. Certain improvements in applying Indian-rubber, or other similarly elastic substance, as springs for carriages.
265. David Collison. Improvements in the construction of shuttle skewers.
412. John Howard. Certain improvements in the construction of steam boilers, or steam generators.
466. Robert Burns and Richard Pritchard Willett. Certain improvements in machinery, or apparatus, for cutting bones.
489. Peter Armand Le Comte de Fontaine Moreau. Improvements in an apparatus for essaying silk, cotton, and other similar fibrous substances.—A communication.
508. William White. An improved fabric suitable for ventilating hat bodies.
519. Mathew Fitzpatrick. Certain improvements in machinery or apparatus to be applied to locomotive engines and carriages for the prevention of accidents, and also in the manufacture and application of indestructible and non-rebounding cushions to be applied to the above, and for other similar purposes.
552. George Hattersley. A radiating hearth-plate.
553. Charles Frederick Bielefeld. Improvements in billiard and bagatelle tables.
578. Bowman Fleming McCallum. A yarn drying machine.
585. John Whitcomb and Richard Smith. Improvements in the manufacture of carpets, hearth-rugs, and other similar fabrics.
612. James Dible. Improvements in ventilating and heating ships, which improvements are also applicable to extinguishing fire on board ship.
614. Charles Dickson Archibald. Improvements in machinery, and apparatus for crushing, grinding, and triturating refractory and other materials, and for washing and separating ores and metals from earthy and other substances.
615. Charles Dickson Archibald. Improvements in lighting and heating.
635. Charles Pryse and Richard Redman. Improvements in a certain description of fire-arms.
678. Robert Isaac Longbottom. Improvements in preventing vibration in railway and other carriages, and in axles.
681. James Arnold Heathcote. Certain improvements in the mode of exhausting syphons or pipes for drawing off fluids.
709. George Lucas. A composition for filling engraved cast or sunk letters, devices, or ornaments on or in brass, zinc, or other metallic plates.
729. Thomas Day. Improvements in landing and screening coals, and delivering them into sacks.
735. Robert Lucas. Improved machinery to be used in the preparation of cotton and other fibrous materials for spinning.—A communication.
736. Somerville Dear. Certain improvements in the arrangement and apparatus of looms for weaving centre or other large patterns or designs in linen, cotton, silk, wool, or other fibrous materials.
737. John Paterson. Improvements in apparatus for shaping collars and other similar linen and cotton articles.
762. Joseph Burley. Improvements in apparatus for cutting fustians and other fabrics, to obtain a cut pile surface.
766. William Marsden. Certain improvements in and applicable to looms for weaving.
772. Isaac Lowthian Bell. Improvements in the treatment of certain compounds of iron and sulphur.
774. John Hinchcliff and Ralph Salt. Improvements in steam engines.
776. Francis Bresson. A new and improved mode of propelling on land and water.
778. Henry Vernon Physick. Improvements in electric telegraphic apparatus, and in machinery or apparatus for constructing the same.
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786. John Burgess. An improvement in dyeing wool.
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795. Henry Bessemer. Improvements in apparatus for concentrating cane juices and other saccharine solutions, and in the treatment of such fluids.
796. Henry Bessemer. Improvements in the crystallization and manufacture of sugar.
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799. Henry Bessemer. Improvements in apparatus for concentrating saccharine fluids.

806. William Dray. Improvements in machinery for crushing, bruising, and pulverizing.
816. William Edward Newton. Improvements in the manufacture of paper.—A communication.
817. John Pepper, junior. A new or improved machine for knitting ribbed work.
818. William Hedges. Improvements in carriages.
827. John Kilner. Certain improvements in the means of insulating the wires of electric telegraphs.
831. William Edward Newton. Improvements in the construction of and method of applying brakes to railroad carriages, engines, and tenders, for the purpose of preventing collisions.—A communication.
833. John Frearson. Improvements in the manufacture of hooks for garments.
835. John Barker. Improvements in separating gold from quartz or matters containing that metal.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

John Gedge. Improvements in the mechanism of looms for weaving.—A communication. Dated November 26.

Jean Hyppolite Salvan ainé. Certain improvements in the manufacture of paletôts and other articles of dress, the said improvements being obtained by an improved process of felting and fulling. Dated November 26.

Daniel Woodall. Improvements in canal boats. Dated November 27.

Jules Barse and Paul Gage. Improvements in apparatus for manufacturing soda-water and other aerated liquids, and likewise in the preparation of the substances employed therein. Dated Nov. 29.

Andrew Edmund Brae. An apparatus for stopping and detaining, or releasing and setting free, cords, tapes, chains, ropes, or other flexible lines, or strings. Dated November 30.

WEEKLY LIST OF NEW ENGLISH PATENTS.

William Gorman, of Glasgow, Lanark, engineer, for improvements in obtaining motive power, which improvements, or parts thereof, are applicable for measuring and transmitting aëriform bodies and fluids. December 8; six months.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Dec. 7	479	Mrs. T. Groom	Sussex-terrace	Elastic self-supporting infant's belt.
8	480	H. Masters	Bristol	Apparatus for heating by gas.

NOTICE TO CORRESPONDENT.

G. Thornally, Leeds.—We feel obliged by your communication, but must decline it. The trisection of half a right angle is a particular case of the general problem, which does not offer any difficulty of construction; and even if it did, there is no operation in the arts which calls for a purely geometrical solution, when very simple and obvious means can succeed.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1532.] SATURDAY, DECEMBER 18, 1852. [Price 3*d.*, Stamped 4*d.*

Edited by R. A. Brooman, 166, Fleet-street.

HUNT'S GOLD-WASHING MACHINE.

Fig. 1.

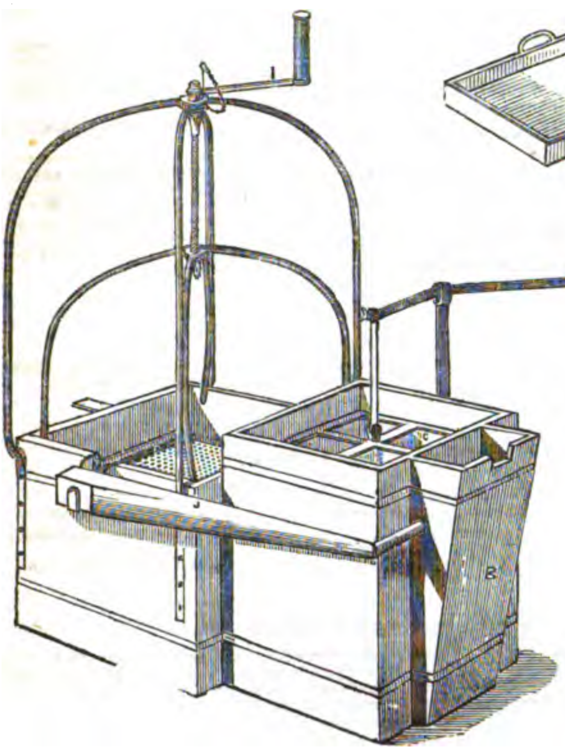


Fig. 4.

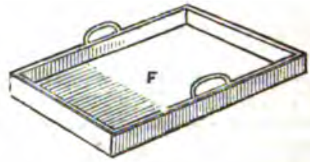


Fig. 5.

Fig. 3.

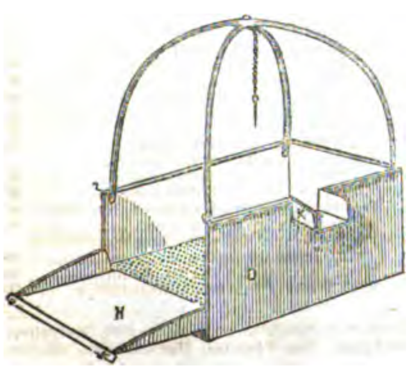
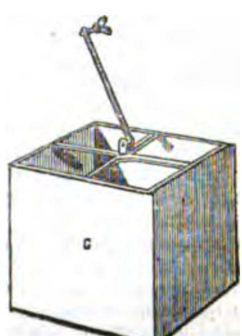


Fig. 2.



HUNT'S GOLD WASHING-MACHINE.

Patent dated July 16, 1852.

This is an apparatus for separating small particles of gold from auriferous ores by the mere process of washing. It is well known that by far the greatest quantity of gold is found in very small grains, and, by an imperfect mode of treatment, much of it is carried away in the washing. By the use of this machine, much of the fine gold which has thus been lost can be recovered with great advantage. The patentee, who has been for many years Concessionaire and Director of the ancient Mine of Pont Pean, near Rennes, in France, and who has had considerable experience in the treatment of ores in separating them from foreign matter, entertains strong hopes that the machine in question will prove highly advantageous to the Gold-seeker, and not only lessen his arduous labour, but considerably increase his profits.

Fig. 1 is a perspective view of the machine complete. The water is introduced at B, and C is a square force-pump, shown detached in fig. 2. D is the ore-receiver. the copper bottom of which is either finely pierced or woven, as shown in fig. 3. Fig. 5 is the scraper used for removing the refuse. Fig. 4 is a tray for receiving the gold which passes through the copper sieve. G is the force-pump handle for putting the machine in motion. H a flap-door at one side of the tray F, which falls, for the purpose of removing the refuse. I, the handle of the screw which raises and lowers the ore-receiver D. J a tube which re-conveys the water from the top of the ore-receiver D to the part B when water is scarce. And K the spout where the water escapes when not required to be used over a second time.

The machine is to be placed perfectly level, taking the advantage, if possible, of any stream of water near the gold or other mineral to be washed, so as to introduce it at B. If a regular stream cannot be obtained, the water must be supplied by artificial means. In the event of there being a difficulty in obtaining the water, the machine is furnished with a tube J, by means of which the same water may be used a great many times, until it becomes too much charged with muddy matter to be any longer fit for use, in which case it must be poured off and a fresh supply procured. The mineral matter to be washed must first be passed through a common sieve, the holes of which are one third of an inch square. What remains on the sieve must be examined, and if it contains any gold it can easily be picked out. The sifted matter must then be put into the receiver D, until it is within one inch and a quarter of the bottom of the water-escape, taking care to have it placed level on the pierced or woven copper bottom. The force-pump C, having been filled with water in order to counterbalance the lift, must then be put in quick motion by means of the handle G, the perpendicular stroke to be about one inch and a quarter, which causes the whole of the matter in the ore-receiver D to be set in motion, the gold or other minerals, according to their specific gravity, falling to the bottom. The grains of gold, which are sufficiently small to pass through the pierced copper plate at the bottom of the ore-receiver D, will be found in the tray marked F, the larger grain will remain on the fine-holed copper bottom; the gold on the bottom and in the tray below can be removed at any time, but as some sand will be mixed with the gold it must be re-washed; this can be done at the end of the day's work, or when a sufficient quantity is accumulated. The tray F, under the ore-receiver D, should be frequently examined, and emptied when full. The time required to keep the force-pump in motion will be about one minute and a half for each charge, when the gold will be precipitated. The ore-receiver must then be raised, by means of the screw-handle I, as far as a hole drilled in the under part of the screw, when a small iron pin must be introduced to keep the ore-receiver in its place until the refuse is removed. This is done by opening the falling-door H in the side, and using the scraper, taking care to leave at least from half to three-quarters of an inch of sand or mineral matter on the copper bottom, so as to prevent any of the gold being lost that may not be perfectly precipitated; the door H is then shut up, and the receiver or sieve screwed down to its place, being kept there by a pin of iron, which is introduced into a hole behind the handle. The tube J must be removed when water is plentiful, and not required to be used over again,

in which case the hole where the small end enters must be shut by a slide fixed inside B for that purpose. Caution must always be used not to allow sand or anything to get between the working parts of the machine.

After the auriferous sand to be operated upon has passed through the sieve of three square holes to the inch, as before mentioned, one active man can wash with a full-sized machine about six hundred pounds an hour; and presuming each hundred weight produced only twenty grains of gold, it would be equal to about two ounces a day, of eight hours' working.

MATHEMATICAL PERIODICALS.

(Continued from page 294.)

XXVII.—*The Mathematical Repository.*

Questions.—In the first number of the Old Series of the *Repository*, Mr. Leybourn adopted most of the questions left unanswered in the *Yorkshire Repository*, of which he was most probably the Editor; to these were added a selection from the *General Theorems* of Dr. Stewart and a few of those collected by the Rev. John Lawson. After the number of correspondents had increased, so as to include many of the ablest mathematicians of the time, the selections from the last named authors formed separate articles, and the questions were wholly furnished by the contributors. The total number of mathematical questions proposed in the Old Series is 330, most of which received answers: in the New Series, 610 questions were proposed, but the work was discontinued with the solution to the "Prize Question 570, by Mr. T. S. Davies." The questions themselves relate to almost every branch of pure and applied mathematics; numerous instances might be selected where topics of the highest interest are discussed with all the elegance due to the writings of Wallace, Gompertz, Cunliffe, Lowry, Swale, Ivory, Whitley, Woolhouse, Godward and Davies, but in a collection which numbers nearly one thousand specimens, and extends over no fewer than nine octavo volumes, such an attempt would be next to impossible. From the commencement of the work, almost to its close, the names of Messrs. Lowry, Cunliffe and Ivory appear as the principal contributors, and as these become less frequent, their places are as efficiently supplied by those of Woolhouse, Godward and Davies. The last volume of the work appears from a statement in the *Philosophical Magazine* for December, 1851, to have been mainly compiled by Messrs. Davies and Woolhouse, and the elegance and importance of many of the questions and solutions can scarcely be overrated.

Contributors.—Messrs. Adams, Baines, Barlow, Babbage (C. B.), Basley, Bosworth, Butterworth, Campbell, Cunliffe, Clarke (*Marloviensis*), Davies, Dawes, Doneld, Evans, Fletcher, Galloway, Godward, Gompertz, Gregory, Hutton (*James North*), Horner, Herschell (J. H.), Ivory (*Astronomicus*), Johnson, Jones, Laws, Lowry (*Amicus*), Leybourn (*Samuel Hornsby*), Mabbot, Marrat, Mason, Nicholson, Noble, Palaba (*Paul Lawrence Baker*), Peacock, Sanderson, Smith, Mrs. Somerville (*A Lady*), Thompson, Tyson, Wallace (*G. V. Scoticus, Edinburgensis*), White, Whitley, Wolfenden (*Senex*), Woolhouse, Wright, &c., &c.

Publication.—The publication of this periodical took place at irregular intervals. No. I. of the Old Series was issued in 1795, and the last Number of Vol. VI. of the New Series in 1835. All the numbers appear to have been "printed and sold by W. Glendinning, Hatton-garden, London."

T. T. W.

Burnley, Lancashire, Dec. 11, 1852.

A TREATISE ON THE SCREW-PROPELLER: WITH VARIOUS SUGGESTIONS OF IMPROVEMENT. BY JOHN BOURNE, C.E. LONGMAN AND CO.

In the present progressive state of the art of propelling ships by means of the screw, a greater service could scarcely have been rendered it than the invaluable work before us will confer. The steady march of improvement in any of the arts of life is never so thoroughly ensured as when its promoters have con-

[illegible]

[illegible] reflecting his [illegible] mechanical [illegible] is pro- [illegible] he was [illegible] which all [illegible]

[illegible] not inde- [illegible] has been [illegible]

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through the water at various speeds, and he gives the practical formula for ascertaining approximately the number of horses power necessary to impel a vessel of given immerged sectional area at a given speed. From the great variation of the resistance estimated to each square foot of immersed section, he suggests that the length of the cross section of that part of the skin of the vessel which is exposed to the water, or the perimeter of the immersed section, would be a better standard. He collects the resistances of a square foot of immersed section, and the corresponding speeds for the *Rattler*, the *Pelican*, the *Minx*, the *Dwarf*, the *Fawn* and the *Fairy*, and they are certainly of a nature to throw doubt upon the accuracy of the hypothesis which makes the unit of immersed section the standard. Whether the linear measure he proposes would agree more closely with results in a long course of experiments cannot well be affirmed at present. From the dimensions of the vessels quoted by him, which are tabulated, it is extremely probable that they would, and the point is worthy of settlement by express trial on an ample scale.

The author proposes, as a means of facilitating the progress of ships through the water, that a stratum of air should be expelled under pressure from a slit in a pipe laid along each side of the keel, which he considers would diminish friction. For slow-sailing ships, he proposes that this should be done at the stem and at the stern, so as to form an elastic bow and stern. In his expectations on this point we certainly cannot go along with him. Undoubtedly a film of air would diminish friction, but we do not see how he can project it along the surface of the vessel; and if he succeeded, it is probable that it would not repay the sacrifice of power, and the mechanical inconveniences that would ensue.

The comparative merits of screw and of paddle-propelled vessels is a matter to which the author has devoted himself with extreme attention, and perhaps there is no subdivision of the whole subject more attractive to the general reader, at the same time that it presents important points for the consideration of the engineer. The celebrated series of experiments with the *Alecto* and the *Rattler*, and the *Basilisk* and the *Niger* will be found narrated in every one of the numerous details which were observed in these admirably conducted trials. The summary of results is a study worthy of the greatest attention, and of the most interesting character. The great point in the relative merits of the two systems seems to be that screw-vessels have not been so effective whilst contending against a strong head-wind as paddle-vessels. Of this the author fully acknowledges the truth, and is ready to enforce a system of practice which will obviate the inferiority on this, the almost single one of the screw system. He proposes that the screw should be immersed more deeply in the water, and placed farther forward in the deadwood than is ordinarily the case, and is careful to point out practically the deviations from the common construction necessary for the purpose. We believe this plan has succeeded admirably in America; and it certainly promises very much, as the reaction of the screw is aided by the pressure of a higher hydrostatic column.

On the subject of slip and its various phenomena, he leaves nothing to be desired in his explanations. It is one of great curiosity and importance, and is well worthy the copious and lucid illustrations which he brings forward to render it thoroughly comprehensible. He shows how to distinguish between positive, negative, and lateral slip, to estimate their respective amounts, and to diminish them, within certain limits of increasing friction. The thrust, friction, and centrifugal action of the screw, which are closely associated as causes with the phenomena immediately before discussed, are gone into at considerable length, and developed in the form most convenient for practice; convenient rules, established by experiment, being furnished for making allowances on their account wherever necessary.

The indicator and dynamometer diagrams taken in the *Rattler* during her trials with the *Alecto*, in 1845, will be found in one of the plates, and their remarkable features are ably discussed in the context.

As might have been expected in a work so elaborate, the author has pointed out with great nicety the relative advantages of screws of various forms when

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ench steam frigate *Pelican*, of the *phion* (the arrangement of which author prefers upon the whole), of *Wasp*, and of the *Ajax*, are the jects of separate plates. The lines sections of many vessels are also en, including those of the *Wasp*, the *Ajax*, the *Fairy*, the *Faon*, the *s Queen*, the *Biche*, the *Sentinelle*, *European*, the *Frankfort*, the *Rat-*, and the *Great Britain*.

he Appendix is extremely valuable its Tables, and for its articles on sub- s of collateral interest. There will ound stated in detail the dimensions performances of screw steam ves- in the Royal Navy, with a full ex- ation of the several columns: the ulated results of experiments with the *ican*; an account of the performance the United States war steamer, the *Jacinto*, of the screw and paddle sels on the Atlantic, a comparison of *San Jacinto* and *Savanae*, and cles on feathering screws, on the pro- essive increase of screw propulsion in Navy; on wooden and iron steamers, d the effect of shot on the latter, and specification of the auxiliary-screw amer, the *Water Witch*.

The typography and general character f the book itself are admirable in the xtreme, and render it as worthy of ossession as a production of art, as the asterly manner in which the subject as been handled recommends it as an uthority.

THE BUNSEN BATTERY.

(From the *Moniteur Industriel*.)

The last number of the *Moniteur Industriel* gives an account of some experiments on the Bunsen battery, which we now translate, and which have led to two highly-important modifications of this galvanic arrangement. One of these modifications increase the internal conductibility, and the other increases tension.

If the diaphragm be removed from a Bunsen battery of which the charcoal is porous, and kept impregnated with nitric acid, it will be found that the internal conductibility of the battery is increased five times. According to the laws of electrical currents, this corresponds to a similar enlargement of surface, but without the increase of cost which would be occasioned by it. This fact has been ascertained by the following experiment:—by means of an element to which this modification had been applied, an electro-magnet lifted a weight 58 kilograms. Now, in order to sustain the same weight by increasing the surface of the old battery, it was found requisite to unite five Bunsen elements by their like poles, so as to form an element of quintuple surface.

In order to keep the porous charcoal impregnated with nitric acid, recourse was had to the following arrangement:—A glass cylinder was placed round the charcoal cylinder, but leaving an annular space, which was filled with nitric acid. The two cylinders were united together at their lower ends with clay or mastic, or when the charcoal should happen to be inside the zinc, it would be sufficient to leave a space in the charcoal.

If in the preceding battery in which the charcoal is impregnated with nitric acid, a diaphragm be re-introduced, charging on the charcoal side with concentrated sulphuric acid, and on the zinc side with diluted acid, as usual, the conductibility of the battery will be nearly the same as in the Bunsen battery, while the tension will be about doubled. If, instead of allowing the concentrated sulphuric acid to act directly on acid of 12 degrees, several diaphragms be interposed, so as to make the concentrated acid act first on an acid of a degree lower, than on a rather higher acid, and so on until an acid of 12 degrees is reached, in which the zinc is immersed, a considerable increase of tension would result, but the precise degree has not as yet been ascertained. Thus, an element of the latter battery is composed, as in a Bunsen battery, of several elements of the same surface, and it costs considerably less.

MAIDENHEAD MECHANICS' INSTITUTION.

The Committee of the Mechanics' Literary and Scientific Institution of this town have opened, in the Town-hall, an exhibition of works of art, mechanism, and manufactures, objects of natural history, specimens of geology, mineralogy, &c. On Thursday, December the 2nd, the day of opening, several hundreds of visitors availed themselves of the opportunity of seeing it, and expressed themselves in the highest terms of admiration and surprise, and by the close of the second day more than 1,600 tickets had been disposed of. The exhibition daily becomes increasingly popular, and will doubtless be visited by every resident of the neighbourhood, as the Committee have responded to the general wish to keep

it open until Wednesday evening, the 8th of December. This is, we believe, the third exhibition of the kind which has been held in England, and reflects the greatest credit on the Committee of the Mechanics' Institution, as well as evinces the energy and spirit of this improving little town.—*Times.*

EXTENSION OF TELEGRAPHIC COMMUNICATION WITH THE CONTINENT.

The lines of electric telegraph, which have just been completed in the Netherlands, connect the following places:—Amsterdam, Breda, Rotterdam, Haarlem, Dordrecht, and the Hague. These places are now, for the first time, in electric communication with Great Britain, by means of the submarine wires.

The following cities and towns are also in communication with the offices in Cornhill: Agram, Aix-la-Chapelle, Amiens, Antwerp, Augsburg, Avignon, Baden, Berlin, Bonn, Bordeaux, Boulogne-sur-Mer, Bremen, Breslau, Bruges, Brunswick, Brussels, Calais, Cassel, Coblentz, Cologne, Cracow, Dantzic, Dieppe, Dijon, Dresden, Dunkirk, Dusseldorf, Florence, Frankfort-on-Maine, Friburg, Ghent, Gotha, Hamburg, Hanover, Havre, Kehl-Strasbourg, Konigsburg, Leghorn, Leipzic, Lemburg, Lisle, Lucca, Lyons, Metz, Magdeburg, Malines, Mannheim, Mantua, Mayence, Milan, Munich, Modena, Nantes, Nuremburg, Ostend, Padua, Paris, Pesth-Buda, Posen, Prague, Presburg, Parma, Rouen, St. Omer, Stettin, Stuttgard, Strasbourg, Trieste, Venice, Verona, Vienna, Weimar.

Marseilles will be connected in a few days.

THE TRADES OF BIRMINGHAM.

The glass trade is looking up. An advance upon this article has taken place, occasioned by the scarcity and high price of coal, and, in some instances, by the demand for some particular description of glass. The Australian trade now constitutes the principal demand upon manufacturers, who are engaged in making articles of general utility. The demand for every description of hardware is really incredible, and fire-arms are in great requisition. The gun-trade is, consequently, in a flourishing state. The men are employed at full and over-time, and are in the receipt of good wages. The local papers are still advertising for hands in various branches, and the condition of the operatives may be said to be highly satisfactory. There is one most gratifying feature connected with this prosperous condition of the working classes in this town—namely, the absence of that thoughtlessness and improvidence which in former days characterised periods of good trade. The men are really industrious, and lose comparatively very little time, are on good terms with their employers, and lay out their wages with great prudence. The Building and Land Societies of the town are in a flourishing condition, and money clubs,—of which there have been for many years a great number in this town,—are weekly increasing. The parochial burdens are being weekly diminished, and would be still further were it not for the great loss of time to which the bricklayers, labourers, and other out-door workers have been subjected during the incessant rain of the last six weeks.

The principal feature in connection with the trade of Birmingham during the past week has been the enormous demand for goods for the Australian market, and the continued advance of the price of raw material. Every vessel which has arrived from the gold region, during the last three months, has brought demands for nearly all descriptions of hardware goods, so that the orders on the books of the manufacturers are now greater than can be executed. The workmen employed in making saddlers' ironmongery, agricultural implements, and fire-arms of all descriptions, are working over-hours, and at increased wages. The mechanics engaged in the above branches are in requisition, and cannot be obtained without difficulty.

In addition to the great advance which has taken place in the price of iron and copper, there is now a rise in the price of tin, of upwards of 2*l.* per ton, as will be seen from the following circular, issued by one of the largest wholesale houses in the trade:—"An alteration has been this day made in the price of tin, of which I beg to inform you. Tin, in blocks, is 99s. per cwt.; in ingots, 99s. 6d.; in bars, 101s.; refined in blocks, 102s.; plate grain, 106s.; granulated, 121s." A scarcity of the article in the market is also reported.

The steel pen trade is unusually brisk, some large orders for fine points having been received from France during the past fortnight, and it is expected before the close of the year that still heavier ones will be received from that country. At the works of Mr. Gillott and Messrs. Hinks and Wells, additional hands have been set on; and at the establishment of the latter, about 25,000 gross of pens are now being made weekly. The export returns of the past month have just been published, and are highly satisfactory, there being a considerable increase in the value of our exports as compared with those for the same month of the preceding years, in which increase the

productions of this district largely participate.

There has been a slight drawback on the exports of hardware, which is attributed by some, and not without grounds, to the high price of the raw material; and so seriously is this said to be felt by at least one very extensive iron-master in this district, that he has blown out two of his furnaces rather than yield to the rage of the high-price mania, and the demands of the men, which are daily becoming so extravagant as to render it impossible to keep pace with them.

The coal trade is still on the advance, and before Christmas it is expected that coal, which a few months ago would not fetch more than 10*s.* per ton, will realise one guinea, and this is beginning to operate seriously upon manufacturing operations.

The glass-manufacture is very active. The Messrs. Chance, at Spon-lane, are extremely busy, and it has transpired during the present week that the lenses and glass apparatus necessary for the cata-dioptric light, hitherto only obtainable in Paris, are now produced by that eminent firm—another valuable addition to Birmingham manufactures.

The retail trade of the town is in a satisfactory condition, and likely to receive an unusual impetus during the present week, from the attraction of the annual cattle-show. This exhibition, which is under the patronage of his Royal Highness Prince Albert, may now be considered as permanently established, and will add very materially to the prosperity of the town. The show this year will not be inferior to any of the kind which have taken place in the county, and it is computed that not less than from 80,000 to 100,000 persons will visit Birmingham during the week.

THE IRON TRADE.

Birmingham.—The excitement which for some weeks past has existed in the iron trade has not in the slightest degree abated, and prices are still on the advance. Some great masters, who at any time from the superiority of their make can command a market, are said to be asking 11*l.* for bars and rods, and 5*l.* per ton has been refused for hot blast pigs made from the mine. The authority from which we have already quoted adds: "It is now certain that neither coal nor iron have reached their highest point, and where this state of things will end, and how, nobody can predict." Iron has now nearly doubled its price in England, and in Scotland they are asking 63*s.* for pigs which only a few months ago could not realise 40*s.* Good ironstone is worth 20*s.* per ton, and extremely scarce, in consequence of several of the pits being flooded.

Glasgow Pig-iron Market — Glasgow, December 11.—Our pig-iron market opened rather strong at the beginning of the week, owing to the reported alteration in the French duties, and several parcels sold at 65*s.* 6*d.* to 66*s.*, cash. Yesterday and today, however, the market has been weak, and closes, sellers at 65*s.* 6*d.*, with buyers at 65*s.* to a limited extent. Bar iron continues firm at 9*l.* to 10*l.*

The Government returns for the month just published show pretty clearly that a great portion of the demand for iron, as we have repeatedly stated, has been for exportation. These returns only come down to the close of October, and the exportations which have subsequently taken place are understood to be immensely greater. The following Table, more particularly interesting to this neighbourhood, may be taken as an indication only of the present state of the iron manufacture in East Worcestershire and South Staffordshire. Exported in October, 1851-52:—

	1851.	1852.	Increase.
	Tons.	Tons.	Tons.
Pig iron................	9,742	12,635	2,893
Bar, bolt, and rod..	33,762	37,648	3,886
Wire	344	501	157
Cast.....................	1,827	4,945	3,118
Wrought of all other sorts......	9,584	11,741	2,157
Increase on the month			12,211

The value, as a matter of course, in consequence of the advance of price, has proportionately increased.

America. — By the advices from New York to the 28th ult., brought to Liverpool on Saturday last by the United States' Mail Steam-ship *Pacific*, we learn that iron was in good demand. 1,500 to 2,000 tons of pig, part to arrive, had changed hands at 28 dols. to 29 dols. per ton, six months; bar iron firm at 53 dols. to 55 dols., six months; refined, 62 dols. to 65 dols.; 200 tons of English common bars sold at 52 dols. to 55 dols., six months; 70 tons of Swedish steel iron at 30 dols.; and 118 packages of best Russian sheet, to arrive, at 16¾c. By the Royal Mail Steam-ship *Asia*, which arrived at Liverpool on Sunday, with advices from New York to the 1st inst., we learn that the market was firm, at 31 to 31·80c., six months.

DIRECT POSITIVE PHOTOGRAPHS ON GLASS.

M. Adolph Martin, in a communication

to the Paris Academy of Sciences, remarks, that collodion sun pictures, notwithstanding the care taken in producing them, and the delicacy of their execution, are nevertheless deficient in harmony. With the view of remedying this defect, M. Martin has devised the following plan of operation, which he states to have been most satisfactory. "The collodion which I employ," says he, "is composed of an ethereal solution of gun-cotton, obtained by treating 2 grammes of cotton with a mixture of 50 grammes of nitrate of potash, and 100 grammes of sulphuric acid. The cotton when thus prepared, and well washed and dried, is entirely soluble in a mixture of 10 volumes of ether, and 1 volume of alcohol, which constitutes the solution, to which about 1 gramme of nitrate of silver, transformed to iodine is now added, having been previously dissolved in 20 grammes of alcohol, by means of an alkaline iodide—iodide of ammonium being used by preference. The plate of glass, covered in the usual way with a thin layer of this substance, is plunged before it becomes dry into a bath, composed of one part distilled water, 1-12th of nitrate of silver, and 1-20th of nitric acid. Afterwards it is plunged into another bath of sulphate of protoxide of iron, and finally washed with care. Up to this moment, the image has remained negative, but on plunging it into a bath composed of the double cyanide of silver and potassium, it immediately becomes positive. All that now remains is to wash it, cover it with dextrine, dry, and finally mount it. The cyanuret bath which I employ, is similar to that used by Mr. Elkington. It is composed of one litre of water, 25 grammes of cyanuret of potassium, and 4 grammes of nitrate of silver. I have now only to remark that this process has always yielded me proofs, which proofs are invariably positive. Their perfection entirely depends on the amount of manipulative care brought to bear in their development."—*Journal of the Society of Arts.*

THE NEW YORK EXHIBITION.

This undertaking is progressing favourably. The association are adopting measures for the establishment, in most of the principal commercial cities of the Union, of local committees for the purpose of making the enterprise more thoroughly familiar to the inhabitants of the different sections of country. The State, city, and national Governments have evinced a ready alacrity in giving every possible privilege and facility to the enterprise; and the following letter—one of the last written by Daniel Webster—to the United States' Ministers at London, Constantinople, Vienna, Paris, and Berlin, showing the existence of this feeling in the State Department, will be read with much interest at the present time :

"Department of State, Washington,
Oct. 12.

"SIR,—I have been applied to by Mr. Theodore Sedgwick, the President of the Association for the Exhibition of the Industry of all Nations, in behalf of the effort now making in New York for the erection in that city next year of a World's Fair, analogous to that which was in London in 1851. The enterprise is in the hands of some of the most respectable of our citizens. Their names are to me, as I know they will be to you, a sufficient guarantee, not only that the affair will be carried out with energy and fidelity, but that it will be treated with large and liberal views as a matter of great public interest and utility. They have, as they inform me, appointed Mr. Charles Buschek, of London, the Austrian commissioner at the Exhibition in 1851, their European agent, and my particular object in addressing you this letter is to convey to you my hope that you will do all you properly can to forward Mr. Buschek's views, and to promote the general objects of the association. The Government, through the proper department at New York, have promised that the building shall be made a bonded warehouse, and of course can go no further in the way of official aid, but I am satisfied that the complete and triumphant success of this enterprise will be a subject of great satisfaction to all our people, and that it will expect that the association should be supported in every legitimate and proper way.

"I am, Sir, respectfully,
"Your obedient servant,
"DANIEL WEBSTER.

"Hon. J. R. Ingersoll."

The same letter was addressed to the Hon. Neill S. Brown, Thomas M. Foote, William C. Rives, and Daniel D. Barnard. —*New York Herald*, Nov. 19.

INCREASE OF SCREW PROPULSION IN THE NAVY.

A contract was entered into last week at the Admiralty, by two eminent engineering firms, for the construction of eight pairs of engines, each pair to be of the collective power of 400 horses, and all adapted for screw propelled ships of war. John Penn and Son have obtained the contract for the 400-horse power engines for the *Royal*

Albert, 120, building at Woolwich Dockyard, and now decided to have new engines on John Penn and Son's patent trunk principle, which gave such satisfaction in the *Agamemnon*, 90, also built at this dockyard. The engines, although nominally of 400-horse power, will be made to work up the power of 1,200 horses; but engines of 600 nominal horse power would have been desirable in the *Royal Albert*, as she is a powerful first-class ship of war, and worthy of having engines of equal power at least as the *Agamemnon*, the latter vessel being fitted with engines of that power. The other ships to be converted into screw steam ships, and fitted each with engines of 400-horse power, by John Penn and Son, are the *Princess Royal*, 90, building at Portsmouth; the *Royal George*, 120, at Sheerness; and the *Euryalus*, 50, building at Chatham. Messrs. Maudeslay, Sons, and Field have contracted for the other four pairs of engines of 400-horse power each, and they are to be fitted with screw propellers for the following ships of war:—The *Exmouth*, 90, building at Devonport; the *Clarence*, 84, building at Devonport; the *Cressy*, 80, building at Chatham; and the *Majestic*, 80, also building at Chatham. The engines of 600-horse power, making by John Penn and Son for the *St. Jean d'Acre*, 100, are now nearly completed, and will be ready for commencing fitting on board when she is launched from Devonport Dockyard, where she is building and nearly ready for launching. The engines of the *Royal Albert* will be ready in June next, by which time the vessel will be ready for launching; and in the course of another year it may be calculated that the following powerful ships will be ready for sea, and all fitted with screw propellers:

ADDITIONS TO THE SCREW STEAM NAVY IN 1853.

The Royal Albert..	120	building at Woolwich.
The Duke of Wellington....	140	fitting at Portsmouth.
The Royal George	120	to be converted at Sheerness.
The St. Jean D'Acre	100	building at Devonport.
The Princess Royal	90	building at Portsmouth.
The Agamemnon	90	fitting at Sheerness.
The Exmouth	90	building at Devonport.
The Clarence	84	building at Devonport.
The Sans Pareil	81	fitting at Devonport.
The Majestic	80	building at Chatham.
The Cressy	80	building at Chatham.
The Imperieuse	50	fitting at Woolwich.
The Euryalus	50	building at Chatham.
Making a total of	1,175	guns of large calibre.

The above vessels are all in so advanced a state that there will be no difficulty in completing them next year should any emergency arise to require their services, and, with the vessels already fitted with screw popellers, they will form one of the most powerful channel fleets ever possessed by this country. The above list does not include any of the guard ships, or any of the ships now building which are ordered to be fitted with engines already in store, the *Algiers*, 90, building at Devonport; the *Hannibal*, 90, building at Deptford, and several others, being ordered to be fitted with engines already made for screw ships of war.

CONFLICTING ACTION OF THE OLD AND NEW PATENT LAWS.

Sir,—By giving publicity to the following, you will aid the cause of justice, and will oblige Yours respectfully,

W. PETRIE.

December 16, 1852.

Copies of the following memorandum were sent by me, a patentee, to the various law-officers, to whom the working of the new Patent-law is entrusted:

"According to existing arrangements, about five hundred patents applied for in October will (probably in many cases) take precedence in point of patent right over a number of the patents applied for in September; because those under the new law may be allowed, at the option of the law-officers, to date from the granting of the provisional protection, while those obtained under the old law, can only date from the day of passing the Great Seal.

"Now, in cases of similarity of invention, this inversion of the dates of patent right as compared with the dates of application for it, will produce great injustice,

and a glaring anomaly in the principles common both to the old and new Patent-laws; inasmuch as the patent right will, in these cases, be secured to one who is confessedly not the first inventor according to the date of application, or even of deposit of outline specification. This will be directly contrary to the fundamental principle, that patent right can only be granted to him who first announces himself to have been the inventor.

"Therefore, it is earnestly hoped that Her Majesty's law-officers will so exercise the discretionary power vested in them, as to prevent the said anomaly and injustice; by dating no patent under the new law so far back as the last patent sealed under the old law. Or if this should seem objectionable, the object may be sufficiently secured by allowing an inventor, whose patent is granted under the old law, to object to certain patents under the new law being dated except subsequently to the date of his own, and by making it a rule to put a subsequent date according to all patents so objected to.

"W. Petrie.

"October 26, 1852."

The reply to this memorandum was, that the case was very fairly put, and that it would be taken into consideration. The matter was again urged on the Lord Chancellor at the time of sealing the patent, and evidence given that no part of the difficulty had been caused by unnecessary delay on the part of the applicant; and to limit the question, a list was sent in of those particular patents under the new law which might interfere. After some delay, the Commissioners said, through their clerk, that they could not interfere.

Thus the latter patentees under the old law (after paying many times the amount required of those under the new law, for their just protection), are liable to have their patents set aside in favour of any similar ideas in the patents under the new law; although these last cannot be even supposed to have been the "true and first inventors," either in equity or common sense, or by evidence of the dates of application, &c. Yet this false preferential status is given to them, unless they, who are patentees under the latter time of the old law, resort in every case to the expensive and tedious remedy of opposing every such patent out of the many hundreds taken out.

It is obvious that the Commissioners, with the powers confided to them (of dating the new patents according to their discretion), and being furnished with a selected list of the new patents likely to interfere, could have had no material difficulty in preventing this anomaly and injustice to those who have already paid so dearly for the rights thus needlessly put in jeopardy or lost.

ARRIVAL OF THE "QUEEN OF THE SOUTH."

The General Screw Steam Shipping Company's auxiliary screw steamer *Queen of the South*, Captain George Hyde, arrived at Sotuhampton on Tuesday morning, from Calcutta, Madras, Ceylon, Mauritius, and the Cape of Good Hope, having landed her mails and a portion of her passengers at Plymouth on Monday. The *Queen of the South* steamed into the tidal basin of the docks at about 10 a.m, and is now safely moored in the inner dock, near the new warehouses in process of construction for the special service of the company to which she belongs. Owing to the fact of this being the first arrival of a ship of this company at Southampton, a great deal of interest was excited, and she was welcomed with a salute from the platform battery, after which the Mayor, accompanied by Mr. R. Andrews, Mr. J. R. Stebbing, Mr. Sampson Payne, Mr. Lankester, the Postmaster, and several members of the Town-council, paid a visit to the splendid vessel, to congratulate Captain Hyde upon her safe arrival. It may be mentioned that as the *Queen of the South* has been the pioneer of the new line of steam communication with India, *viâ* the Cape, under the new contract with the Admiralty, her performance of the service is regarded as most satisfactory. She would have arrived at least a fortnight since, but for an accident to her screw, between the Mauritius and the Cape, by which one of the blades was broken off, and its efficiency as a propeller greatly impaired. Four days were also lost off the Cape during which time the ship was prevented by a heavy gale from embarking the mails, eight days likewise being consumed in Simon's Bay by an unsuccessful attempt to repair the damaged screw. These, with other minor detentions for coaling, &c., are sufficient to account for the protracted voyage; but experience has been afforded that ships of this class are admirably adapted for the India and Cape mail-packet service, and that they will, under ordinary circumstances, perform their work with the highest degree of speed and regularity. We are told that on certain occasions the *Queen of the South* has made as much as 13½ knots under canvass alone. The passengers speak in the highest terms of admiration of the vessel, her sea qualities, and general arrangements, and have presented testimonials to Captain Hyde, and his officers, and to the Purser, Mr. Pearson. Mr. James Laming (the originator of the

General Screw Company), arrived here to-day, to take care of the Company's interests and to superintend the general business. The cargo of the *Queen of the South* consists of 202 chests of indigo from Madras, 108 bales of silk from Calcutta, 10 cases of essential oils, 31 cases of lacdye, 5,135 round-iron shot for the East India Company, and a large quantity of sundry merchandise, all of which will be discharged on Wednesday.

MR. C. PEARSON'S CITY PROJECT.

Mr. Charles Pearson's plan for a "Central City Railway Terminus," has at length assumed the shape of a "company," for carrying it into practical effect. The prospectus states that the new company is formed on the basis of a capital of 600,000*l.*, in 60,000 shares of 10*l.* each. The trustees comprise the names of Mr. Masterman, M.P.; Baron Lionel Rothschild, and Sir James Duke, M.P.; and the list of directors includes gentlemen of known respectability and business talents. Mr. Charles Pearson occupies the position of honorary director. At present the directors intend to limit their application to Parliament during this session for leave to carry out only the northern portion of the plan, which will include the new street to Battle-bridge, and the trunk railway from Holborn-bridge to King's-cross; the estimated cost of completing the street and the line is 1,000,000*l.*, or 400,000*l.* for the street, and 600,000*l.* for the railway. On a moderate computation of the revenue a dividend of from 5 to 7 per cent. is estimated on a capital of 600,000*l.* This is, however, but one portion of the undertaking, and whenever a junction shall be formed with the north-eastern and north-western metropolitan railways, a large accession of revenue and profit must inevitably result.

INSTITUTION OF CIVIL ENGINEERS.

The usual weekly meeting of the Institution was held on Tuesday, the 14th instant, James Meadows Rendel, Esq., President, in the Chair.

The discussion on Mr. Rawlinson's Paper "On the Drainage of Towns," was again resumed, and occupied the whole of the evening.

It was contended, that the absence of a clear understanding of the subject before the meeting had arisen from certain doctrines having been promulgated, in the published Reports of the Board of Health, almost amounting to the prescription of a stereotyped mode of treating all cases of drainage, however various and peculiar the local circumstances might be. This assumption, by a public board, was strongly combated; and it was shown, that to the judgment and experience alone of the engineer, could safely be entrusted the design and execution of works, of such importance to the community, as the sewerage and drainage of cities and towns, in no two of which the circumstances could be identical.

Small pipe-drains might be efficient, if circumstances never changed and accidents never occurred; but the Report from the Commissioners of Sewers showed that, notwithstanding every care, the most extraordinary articles found their way into the small conduits, and their entire failure ensued; besides, that unless a heavy pressure of water was used, in conjunction with pipe-drains, stoppages would occur; and this pressure system, like a great influx of storm-water, for the conveyance of which pipe-drains were not adapted, caused such an accumulation of back water, as flooded the basements of the houses.

The system of combined back drainage was shown to be decidedly objectionable; and that even as tributary drains the pipes should only be used when they connected directly with main or arterial sewers.

The statement of a greater amount of velocity of flow in, so called, smooth pipes, was proved to be a fallacy and a delusion; the correctness of the formulæ of Du Buat, Eytelwein, Prony, and Poncelet was maintained, and the close approximation of the results of actual experiments, on a large scale, with these formulæ, was exhibited in a tabular form.

It must be admitted, that permanency and durability should be the first consideration of an engineer, in designing drainage work; and it was well known, that at inclinations mentioned by the author of the paper, the abrading action of grit, on the bottom of pipes, or even on ordinary bricks, would soon wear them away, therefore thin pipes and hollow bricks were not to be used for main sewers, in great thoroughfares, or where tearing up the streets would be prejudicial to public convenience, or cause danger to the adjoining buildings.

The plan now in course of trial at Leicester, under Mr. Wickstead, for separating the fertilizing matter, in a solid state, from the sewage water, by which the latter was deprived of its noxious properties, was mentioned with praise.

The practice of constructing the main sewers at Liverpool, by cutting the sandstone rock to a curve, so as to form a natural invert, and arching over the top with bricks, using pipe drains only, for separate

feeders; from each house, and court, as the case might be, was fully described and stated to be very successful.

The selection of proper outfalls, was admitted to be a chief consideration in all designs of sewerage; and pumping was demonstrated to be open to serious objections, on the points of cost, and liability to flooding, in case of extraordinary rain-fall, or of the derangement of the machinery, which must of necessity be in duplicate, as the pipe drains could not be used like large sewers, as elongated reservoirs, during such a stoppage as that of sixteen hours out of every twenty-four hours, which actually occurred, by the action of the tide, on many of the sewers of the south district of London.

It was announced that the Annual General Meeting would be held, on Tuesday evening, December 21, when the Annual Report would be read, and the Ballot for the President, Vice-Presidents, and other Members of the Council would take place; the Medals and Premiums be distributed, and no papers would be read at that meeting.

THE PATENT LAW AMENDMENT ACT.

On Friday a bill to substitute stamp duties for fees on letters patent for inventions, and to provide for the purchase for the public use of certain indexes of specifications, was printed by order of the House of Commons. Several clauses in the Patent Law Amendment Act, with the schedule of fees, are to be repealed. A similar schedule of fees is inserted in the present bill. It is declared that letters patent shall be subject to avoidance on non-payment of the stamp duties. The duties are to be under the management of the Inland Revenue Commissioners, who are to provide proper stamps for the purpose. It appears that Mr. Bennett Woodcroft has made several thousands of indexes of specifications, which are of value, and the bill is to empower the Treasury to purchase the same for a sum not exceeding 1,000*l*.

SOCIETY OF ARTS.—EXHIBITION OF RECENT INVENTIONS.

The fourth Annual Exhibition of recent inventions by the Society of Arts was opened on Wednesday last at the Society's House, where it attracted a large number of members and their friends.

We regret exceedingly that an extreme pressure on our pages prevents us from noticing a portion of the machines and instruments exhibited, as we intended to do, but we purpose describing the most remarkable of them during the period of the exhibition.

The chair was taken on the occasion by Robert Stephenson, Esq.

SOIREE OF THE LONDON MECHANICS' INSTITUTION.

On Monday evening last, a *soirée* and *conversazione*, in celebration of the twenty-ninth anniversary of this excellent institution, was held in the theatre of the institution; Southampton-buildings, Chancery-lane. Lord Dudley Stuart, M.P.; Mr. Oliveira, M.P., and other influential gentlemen, were present.

Lord Dudley Stuart, in addressing the meeting, spoke briefly but forcibly in favour of mechanics' institutions, and the benefits which had already accrued from their establishment. The plan was yet in its infancy, but he did not doubt that when the sphere of their operations became more extended, and better appreciated, still more gratifying results might be looked for. His lordship, after passing a high eulogium upon the character of the late Dr. Birkbeck, the original founder of these institutions, regretted that the Government had not thought proper to award more than a pension of 50*l*. per annum to Dr. Birkbeck's widow, though it was partly accounted for by the Secretary of State being limited to an annual expenditure of 1,200*l*. in pensions upon the Civil List. Such a scanty sum as 1,200*l*. per annum was totally insufficient to meet the many just claims upon it which were brought to the notice of the Government in the course of the year; and though he had always been averse to any lavish expenditure of the national income, he would gladly give his support to any measure which might be brought forward to increase the sum so placed at the Secretary of State's disposal.

After the address, the meeting was entertained until a late hour by musical and dramatic performances by the members of the musical and elocution-classes connected with the institution.

The exhibition of philosophical instruments, of works of art contributed by manufacturers, and of mechanical, architectural, and landscape drawings, executed by students in the institute, though not so extensive as on former occasions, was of a very superior character in point of selection and arrangement.

THE SMITHFIELD CLUB EXHIBITION OF AGRICULTURAL IMPLEMENTS.

In our notice of the agricultural machinery exhibited at the Smithfield Club

Show last week, we inadvertently described Messrs. Clayton, Shuttleworth, and Co., the well-known engineers, of the Stamp-end Works, Lincoln, as of Stamford. We beg leave now to draw attention to, and correct the error.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING DECEMBER 16, 1852.

WILLIAM SEPTIMUS LOSH, of Wreay Syke, near Carlisle, gentleman. *For improvements in the purification of coal gas.* Patent dated May 29, 1852.

Mr. Losh's improvements consist mainly in the application of chloride of lead to the purification of coal gas. The manner in which this substance is used is as follows:

The chloride of lead is reduced to powder and mixed with an equal bulk of coarsely-powdered coke, or of sawdust, in order to allow the gas to move readily through it.

The mixed materials, in a damp state, are then laid upon the shelves of an ordinary dry lime purifier, and when the purifier is charged, the gas is turned on, and in passing through the chloride of lead and coke, or sawdust, is deprived in a great measure of its ammonia and sulphurous components, which are decomposed and remain in combination with the chloride of lead, while the purified gas passes on to the place where it is required for use. Two such purifiers are used in conjunction, and when one ceases to act, the gas is turned on to the second while the former one is being recharged, and so on alternately.

In order to restore the saturated chloride of lead to a fit condition to be again used, it is well washed in order to separate the ammonia, sulphur, &c., which are evaporated to dryness, and is then passed through a brake sieve in order to rid it of the coke or sawdust which may have been used, after which the lead is treated with hydrochloric acid and converted to a chloride, which may be again used as before.

Claims.—1. The application of chloride of lead to the purpose of purifying coal gas.

2. The obtaining the soluble salts or compounds formed by the action of chloride of lead upon coal gas.

3. The reconverting the lead into chloride of lead to be used in the purification of coal gas.

WILLIAM RETTIE, of Aberdeen, lamp-manufacturer. *For certain improvements in lamps and burners, in apparatus for ventilating apartments, and in the mode of working signal-lamps.* Patent dated 8th June, 1852.

The "improvements in lamps and burners" have more especial relation to such as are used for signalising purposes, and consists in using oblong instead of circular lenses, in order to give an increased field of light without augmenting the size of the lamp, and in mounting the coloured signal-glasses in a frame which is capable of rotation around the burner, so as to bring any required signal between the lens and burner, to intercept the rays of light, and cause them to assume the particular colour of the signal-glass in action. The burners for lamps of this description have a chimney composed partly of glass, and partly of metal or wire gauze; the glass portion, which is the lowest, is mounted so as to be capable of being raised or lowered to admit of the burner being cleansed when requisite.

The improved "apparatus for ventilating apartments" comprises:—1. A transparent ventilator, which consists of two circular frames placed against each other, and having radial slots, the alternate ones of which are filled with plain or coloured glass. One of the frames turns on an axis, so that the open slits may be brought over each other, more or less, as required, and the admission of air to the apartment thus regulated. A spring is provided for keeping the ventilator closed, except when pressure is applied to the moveable frame. 2. An arrangement for carrying off the odours arising from cooking-stoves, by means of a hood applied to the stove, and having a valve opening into the chimney of the apartment, by opening which valve a draught is created, which effectually answers the purpose.

The improved "mode of working signal-lamps" has reference to those used on board ship, and consists in so combining a lamp with the rudder of a vessel, that by the motion of the rudder signals may be produced by the exhibition of different coloured lights, so as to indicate the direction in which a vessel is being steered.

THOMAS WILKS LORD, of Leeds. *For improvements in machinery for spinning, preparing, and heckling of flax, tow, hemp, cotton, and other fibrous substances, and for the lubrication of the same and other machinery.* (A communication.) Patent dated June 10, 1852.

The *first* improvement consists in covering the surfaces of the rollers used in machinery for preparing fibrous materials with leather, gutta percha, or India rubber, which is let into a groove formed in the surface of the roller, and secured by pins, and other means of fastening. A brush is used in combination with such rollers, but revolving in th eopposite direction, for clearing off adhering fibres.

The *second* improvement consists of an

arrangement of heckling machinery, wherein the heckles are mounted in rows on the periphery of two or more drums or cylinders, around which is passed an endless band, to which are attached the holders for bringing the fibrous material to the heckles.

The *third* improvement consists in a somewhat similar arrangement for scutching purposes, in which the heckles are replaced by bars, which serve as beaters, the bars having brushes placed between and projecting beyond them.

The *fourth* improvement has relation to screw-gill machinery, and consists in giving a peculiar form to the ends of the gill bars or fallers, and in arranging the cams by which they are actuated, so as to reduce their length of stroke, the two sets of bars being placed between the screws, the upper set working in the lower side of the upper screws, and the lower set in the upper side of the lower screws.

The *fifth* improvement consists in a mode of regulating the tension on the bobbins of roving and spinning machinery by means of a stretched tape which comes in contact with the spindle, and by means of which the drag on the bobbins is regulated, the arrangement being such that the tension on the tape is relaxed as the filling of the bobbin proceeds.

The *sixth* improvement consists of an improved flyer and spindle for spinning machinery.

The *seventh* improvement consists in using grindstones set in the sliding-bed of a lathe for smoothing and polishing the large wheels and discs of spinning and such like machinery.

The *last* improvement consists of a method of lubricating the vertical spindles of spinning and other machinery, by prolonging the fixed bearing through which the spindle passes, and surrounding it with a revolving oil-cap.

WILLIAM BEASLEY, of Kingswinford, *For certain improvements in the manufacture of metal tubes and solid forms, and in apparatus and machinery to be employed therein.* Patent dated June 10, 1852.

The mode in which Mr. Beasley manufactures his improved tubes for gun-barrels and other purposes is as follows:—He takes a strip of metal, the edges of which are thicker than the other parts, and which is made concave or hollow on the under side, and winds it spirally, and overlapping at the edges around a mandril. The form of the mandril is so far peculiar, that it is made square at one end to fit into a socket or holder, and is furnished with two collars, one fixed and the other moveable, at the commencement of the squared portion of its length. When the strip has been wound in this manner, it is taken off the mandril and placed in a furnace which has doors at the front and back ends, where it is heated to a welding temperature, and the mandril having been introduced, it is laid hold of with tongs, and drawn by a draw-bench between plain or taper-grooved rolls, and then cross-rolled either with or without an additional heating, so as to complete the welding of the seams. If the tube is to be parallel-sided, the rollers will be set with their axes parallel, but their axes will be further apart at one end than at the other when taper tubes are to be produced. Another method of effecting the welding is to introduce a short mandril into the tube as soon as withdrawn from the furnace and placed in the cross-rolls, and before their action is commenced, then to hammer up the mandril so as to "jam up" or crush the seams together, the end of the tube bearing, during this time, against a fixed holster, and finally to cross-roll the tube until the welding is completed. During the process of cross-rolling, Mr. Beasley applies a hot blast throughout the length of the tube, so as to keep it at a suitable temperature, or a cold blast when the tube is to be cooled. In order to loosen the tube from its mandril, it is passed between parallel rolls revolving in the same direction. And when the tube is removed, it is bored and finished in the usual way. The dies which Mr. Beasley prefers to use, whether for drawing tubes or solid rods, are formed of concentric rings of metal, held together by stays, and whilst the process is being performed, he applies steam or water to harden the metal, by which means the finished article will be free from scale.

Claims.—1. The employment of strips of metal bevelled in the usual manner, but hollow or concave on one side as described.

2. The new form of mandril.

3. The mode of crushing or jamming up the seams of the coil during the process of cross-rolling.

4. The manufacture of twisted tubes by welding them by means of cross-rolling.

5. The application of hot or cold blast acting on the entire length of the tube during the process of cross-rolling.

6. The use of the rolls described for the purpose of loosening the tube from the mandril.

7. The use of the die described for drawing tubes and solid metal rods.

JOSEPH BRANDEIS, of Gt. Tower-street. *For improvements in the manufacture of raw and refined sugar.* (A communication.) Patent dated June 12, 1852.

These improvements consist in the use of

the sulphurets and hydrosulphurets of soda, potash and ammonia, for precipitating the lead used in refining saccharine solutions, and in a mode of removing the excess of precipitant employed.

The sugar under treatment is dissolved in the usual way, and when heated to 180° Fah., or thereabout, about $1\frac{1}{2}$ per cent. of subacetate of lead is added, and stirred in, and after this the solution is filtered. To the filtered liquor is then added a sufficient quantity of hydro-sulphuret, or sulphuret of soda, potash, or ammonia, to precipitate every trace of the lead in solution, which may be tested by hydro-sulphuric acid. The excess of precipitant is removed by means of some insoluble salt of lead, such as the phosphate, tartrate, or sulphate, or of manganese, such as the phosphate, &c., after which the saccharine solution is filtered, and boiled and crystallised in the ordinary manner.

Claim.—The use of the sulphurets and hydro-sulphurets of soda, potash, and ammonia for precipitating lead from saccharine solution.

HENRY HOULDSWORTH, of Manchester. *For improvements in embroidering machines and in apparatus used in connection therewith.* Patent dated June 10, 1852.

Mr. Houldsworth's improvements apply to embroidering-machines constructed on the principle of Mr. Henry Bock's patent of May 2, 1829, and comprise, an improved construction of clearer, for keeping the embroidering threads from twisting when slackened by the going in of the carriages, and from knotting when drawn through the cloth; an improved faller for clearing the threads from the beards of the needles; an improved mode of maintaining perfect adjustment of the needle beds; an apparatus for stopping the carriages when the embroidering threads knot, and for slackening the motion of the carriages when the tension of the threads requires it, and when the carriages approach the stops in their inward course; an improved permanent frame for holding the cloth distended in the machine; an improved skeleton frame, so arranged as to prevent marking or fraying of the cloth whilst held distended; and an improved arrangement of the threading frames, whereby the length of the threads introduced into the needles is equalized.

The claim is for the several improvements described, as applied to machinery for embroidering, whether used singly or in connection or combination with each other.

JEAN ERNEST BEAUVALET, of Paris, gentleman. *For improvements in the manufacture of iron and steel.* (A communication.) Patent dated June 12, 1852.

This invention consists in manufacturing malleable iron and steel from cast-iron, by heating it in contact with a metallic oxide, or a carbonate containing a sufficient proportion of oxide, and then rolling or hammering it without previous puddling.

The cast-iron to be converted should be cast in bars or plates, and in such a way that the bubbles and impurities may form the end of the bar or plate, and be cut off with the rough end, instead of being distributed over the entire surface; and the bars or plates should also be of such size that, when extended by rolling, they will give the required form of bar or plate to be produced.

The substances used for effecting the conversion of the cast-iron are (by preference) protoxide of zinc and calamine; but the oxides of iron, red oxide of manganese, deutoxide of copper, protoxide of tin, or oxides of lead, may be also employed. The protoxide of zinc, calamine, and the oxides of iron (when not containing too large a proportion of silica) are the most suitable as the character of the product is effected by the use of the other oxides named, the metals disengaged from which enter into combination with the iron, and thereby form an alloy. The quantities of oxide employed will vary with the degree of decarbonisation to be effected.

The cast-iron bars or plates to be converted, having been placed along with a proper quantity of the particular oxide employed in a cementing-case, are raised to a cherry-red heat in a suitable furnace, and kept at this heat till the process is completed. The rate at which the process proceeds is about one-third of a line from each surface in twenty-four hours. For making steel, a less quantity of oxide should be used, or the process continued for a less time. The metal is then to be extended by rolling, and the rough ends cut off when it will be ready for the market.

Claim.—The manufacture of malleable iron and steel from decarbonated cast-iron without casting, by heating the cast-iron in contact with a metallic oxide, and then extending it by rolling or hammering, without previous puddling.

Specifications Due, but not Enrolled.

WILLIAM HAUGHTON, of Manchester. *For improvements in machinery for spinning cotton and other fibrous substances.* Patent dated June 5, 1852.

EDME AUGUSTIN CHAMEROY, of Paris, manufacturer. *For certain improvements in steam engines.* Patent dated June 8, 1852.

MICHAEL JOSEPH JOHN DONLAN, of Rugeley, Staffordshire, gentleman. *For improvements in treating the seeds of flax and hemp, and also in the treatment and preparation of flax and hemp for dressing.* Patent dated June 10, 1852.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated November 16, 1852.

767. John Ramsbottom. Certain improvements in steam engines.

Dated November 24, 1852.

836. William Oldham. An improved dibble drill.

837. Augustus Turk Forder. Improvements in fenders for railway carriages.

838. James Carter. Improvements in the manufacture of certain articles of dress or apparel.

839. James Higgin. Improvements in the manufacture of certain mordants used in preparing woven or textile fabrics for printing, staining, or dyeing them, and in the mode or method of using the same or other mordants for the said purposes.

840. John Gedge. An improved self-regulating artificial incubator.—A communication.

841. Peter Armand Lecomte de Fontainemoreau. Improvements in machinery for manufacturing fishing and other nets. A communication.

842. Augustus Brackenbury. Making an electrifying-machine of materials not hitherto used for such a purpose.

843. Henry Richards Caselli. Improvements in the construction of anchors.

844. Richard Greenwood. Certain improvements in warming the upper rooms of houses.

845. John Richard Cochrane. Improvements in the manufacture or production of ornamental or figured fabrics.

846. Joseph Henri Combres. Preventing the ill effects of dampness in walls and dwellings. A communication.

847. Henry Thomson. Improvements in apparatus to be used in dyeing, bleaching, and other processes in which goods are operated upon in the piece.

848. Charles Finlayson. Improvements in apparatus for heating, drying, and ventilating.

849. Achille Jean Louis Hypolite Tourteau Comte de Septeuil. Improvements in the construction of electro-magnetic engines and in batteries.

850. William Henry Winchester. Improvements in splints.

851. William Wilkinson. Improvements in the manufacture of looped and textile fabrics, and in machinery for producing the same.

852. Alphonse Joly. Certain improvements in steam engines.

853. Stephen Spalding. An apparatus or machine for the manufacture of pantiles used in building purposes.

854. Edward Aitchison and John Evans. Improvements in furnaces.

855. Robert Mortimer Glover. Improvements in coating the bottoms and other parts of ships and vessels, in order to prevent animal and vegetable growth in contact therewith.

Dated November 25, 1852.

856. Richard Dudgeon. An invention for raising heavy weights, by means of a portable hydraulic press.

858. John Tatham and David Cheetham. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous substances.

859. Thomas Bennett. Improvements in heating air for blast furnaces.

860. William Hall. Improvements in rotary steam engines, governors, and apparatus for supplying boilers with water, and for regulating the same.

861. James Murdoch. An improved machine for shaping staves for casks, vats, and other similar vessels. A communication.

862. Andrew Jeffrey. Improvements in reaping-machines.

863. Henry Holland. Improvements in the manufacture of umbrellas and parasols.

864. Maximilian François Joseph Delfosse. Improvements in preserving wood, stuffs, and other fabrics, and in rendering them uninflammable. A communication.

865. Charles Harford. Improvements in rotatory engines.

866. James Robertson. Improvements in furnaces or fireplaces.

867. Charles Isles. Improvements in the manufacture of chimney-pieces.

Dated November 26th, 1852.

868. Amédée Francois Rémond. A new or improved lock. A communication.

869. Adam Ogden and John Ogden. Improvements in machinery for spinning cotton or wool.

870. James Ward Hoby and John Kinalburgh. Improvements in the manufacture of metal castings.

871. James Taylor. Certain improvements in, and applicable to, floating graving-docks for repairing and building ships.

872. Auguste Edward Laradoux Belford. Improvements in the manufacture of bricks. A communication.

873. Charles Claude Glover. A system of stoppering instantaneously bottles and other vessels used for containing aerated liquids.

874. Paul Sormani. An improved travelling-case.

875. Armand Jean Constantin Hudault. An improved leaven.

877. Thomas Ainsley Cook. Improvements in bleaching.

878. Thomas Charles Medwin. Improvements in water-gauges, or instruments for indicating the height of water in boilers.

879. Jean Ambroise Oudart. Improvements in presses for obtaining copies of letters, and other like purposes.

880. Alexander Turiff. Improvements in moulding or shaping metals.

881. Henry Bollmann Condy. Improvements in the manufacture of acetic acid and acetates.

882. Antonio Fedele Cossus. Improvements in lubricating apparatus.

883. William Massingham. Improvements in carriages and apparatus for carrying the dead.

884. Robert Barnard Feather. Improvements in the construction of ships, and in rendering ships and boats impervious to shot.

885. George Augustus Huddart. Certain improvements in tools for cutting or abrading metallic and other surfaces.

886. Edwin Lewis Brundage. Improvements in apparatus for drawing off fluids from animal bodies.—A communication.

887. Thomas Wood. Improvements in the mode of obtaining motive power.

888. George Augustus Huddart. Improvements in facilitating combustion in steam-boiler furnaces.

889. George Augustus Huddart. An improved manufacture of artificial flies.

890. Mathurin Jean Prudent Moriceau. Improvements in sharpening and dressing the cards of carding-machines, and the clippers and cylinders of shearing-machines.

Dated November 27th, 1852.

893. John Lotsky. Improved playthings, hereby denominated Pestallozzian Gymnastic Playthings.

894. William Joseph Curtis. Certain improvements in the formation of tramroads or railroads, and carriages that run thereon.

895. Emile Martin. Certain improvements in the mode of extracting gluten from wheat, and for preparing and drying the same by mixing to several degrees of concentration.

896. John Gilmore. An improved mode or means of extinguishing fires in ships or other vessels.

897. George Houghton. Improvements in the manufacture of college caps.

898. William Edward Schottlander. Improvements in machinery for boring the ground, stone, or rocks, for the formation of drains and sewers for the laying of pipes underground, and for removing obstructions therein, also in the manufacture of pipes to be used in connection with such machinery, and in instruments for surveying and levelling preparatory to the boring operations.—A communication.

Dated November 29th, 1852.

899. Frederick Westbrook. Improvements in clasps for books.

900. Samuel Cunliffe Lister and James Warburton. Improvements in the manufacture of yarn from fibrous materials.

901. Thomas Dudgeon. Improvements in hydrostatic propulsion.

902. William Fowler and William McCollin. A machine constructed and adapted for a clod-crusher and land cultivator.

903. William Pink. An improved construction of stirrup-bar for saddles.

904. Eugéne Nicholle. Improvements in apparatus for damping, cutting, and attaching stamps and labels.

905. Matthew Samuel Kendrick. Improvements in grates and fire-places.

906 Matthew Samuel Kendrick. Improvements in lamps and burners, and in the apparata to be used therewith.

907. Jean David Schneiter. Improvements in maps and charts.

908. Francis William Ellington. Improvements in the making of screws for collapsible and other vessels.

909. William Brown. Improvements in electric telegraph instruments.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," Dec. 14, 1852.)

86. David Dunne Kyle. An improved method of excavating and removing earth.

177. Willaim Simpson and John Shelton Isaac. An improved composition to be used principally as a substitute for wood or other materials, where strength and lightness are required in the manufacture of various articles.

452. John Carnaby. Apparatus for turning, managing and regulating the main taps of gas pipes laid on to houses or buildings at a part of the house or building distant from the main tap.

574. John Gedge. Improvements in printing-presses or machines. A communication.

634. Emily Pettit. A musical instrument, which she calls a euphotine. A communication.

691. William Gossage. Improvements in obtaining sulphur from certain metallic sulphurets.

732. Robert John Smith. Certain improvements in machinery or apparatus for steering ships and other vessels.

782. John Venables Vernon and John Edge. Improvements in apparatus and machinery for engraving rollers of glass, copper, brass, and other metallic compounds.

791. Richard Kemsley Day. Improvements in the manufacture of fuel for lighting fires.

802. John Brettell Collins. A new improved flooring-cramp or lifting-jack.

803. James Nasmyth. Certain improvements in machinery or apparatus for packing and compressing cotton, wool, and other substances.

804. Thomas Ellis, sen. An improvement or improvements in constructing a metallic band or bands for raising and lowering heavy weights, and other like purposes.

808. George Wilson. An improved manufacture of glass bottles and jars.

812. William Crosskill. Improvements in clod-crushers, or rollers for rolling, crushing, or pressing land.

820. Samuel Hunter. Improvements in anchors.

824. John Winter. Improvements in the mode of combining bars of iron so as to form larger masses or pieces of iron applicable in the manufacture of axles, shafts, columns, beams, cannon, and other articles.

825. John Winter. Improvements in the manufacture of wheels.

826. Francis Bywater Frith. Certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, cords, beaverteens, and other similar fabrics composed of cotton, silk, wool, and other fibrous materials.

832. John Beale. An improved arrangement of steam engine, and an improved packing to be used therein.

850. William Henry Winchester. Improvements in splints.

851. William Wilkinson. Improvements in the manufacture of looped and textile fabrics, and in machinery for producing the same.

854. Edward Aitchison and John Evans. Improvements in furnaces.

856. Richard Dudgeon. Raising heavy weights by means of a portable hydraulic press.

857. John Gedge. Improvements in the mechanism of looms for weaving. A communication.

862. Andrew Jeffrey. Improvements in reaping-machines.

863. Henry Holland. Improvements in the manufacture of umbrellas and parasols.

865. Charles Harford. Improvements in rotatory engines.

867. Charles Iles. Improvements in the manufacture of chimney-pieces.

871. James Taylor. Certain improvements in and applicable to floating graving docks, for repairing and building ships.

880. Alexander Turiff. Improvements in moulding or shaping metals.

881. Henry Bollmann Condy. Improvements in the manufacture of acetic acid and acetates.

883. William Massingham. Improvements in carriages and apparatus for carrying the dead.

897. George Houghton. Improvements in the manufacture of college caps.

898. William Edward Schottlander. Improvements in machinery for boring the ground, stone, or rocks, for the formation of drains and sewers, or for the laying of pipes underground, and for removing obstructions therein. Also in the manufacture of pipes to be used in connection with such machinery, and in instruments for surveying and levelling preparatory to the boring operations. A communication.

900. Samuel Cunliffe Lister and James Warburton. Improvements in the manufacture of yarn from fibrous materials.

WEEKLY LIST OF PATENTS UNDER THE PATENT LAW AMENDMENT ACT, 1852.

Sealed Dec. 8, 1852.

51. Thomas Craddock.
70. Robert Lakin and William Henry Rhodes.
88. George Holcroft.
96. Henry Bridson.
117. John Wilson Fell.
151. David Wilkinson Sharp.
187. Alexander Miller.
188. John Weems.
190. James Anderson Young.
214. Thomas Kennedy.
215. John Erskine.
255. John Crook and John Wilkinson Wood.

279. James Clark.
294. Mitchell Thompson.
304. John Paterson.
314. Richard Husband.
325. John Henry Johnson.
331. David Laidlaw.
364. Matthew Smith.
367. Peter Armand Lecomte de Fontainemoreau.
369. Thomas Suttie.
428. John Campbell.

Sealed December 11, 1852.

77. Stephen Soulby.
78. William Smith.
79. Henry Smith.
80. Matthew Walker.
81. Frederick Osbourn.
237. Herm Jäger.
290. William Horsfield.
407. Charles Henry Waring.

Sealed December 15, 1852.

150. Thomas Boyd.
193. Ralph Errington Ridley.
370. Robert Pinkney.
380. Alfred A. De Reginald Hely.
409. Evan Leigh.
423. Samuel Fletcher Cottam.
425. William Roberts.
426. George William Lenox and William Roberts.
475. John Currie.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF NEW ENGLISH PATENTS.

William Hodgson, of Skircoat, York, engineer, for improvements in the manufacture of woven, textile, and looped fabrics, and in the machinery employed therein. September 30; six months.—N. B. This patent being opposed at the Great Seal, was not sealed till December 15, but bears date the 30th of September last, the day it would have been sealed but for the said opposition.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Dec. 9	3396	W. Mitcheson & Sons	Garford-street, Limehouse	Anchor.
10	3397	John Worrall	Bernard-lane, Sheffield	Tackle.
,,	3398	Thomas Carr	Chowbent, Manchester	Spinner's bobbin and nail coat.
13	3399	John C. Boucher	Birmingham	Coat.
14	3400	Frederick Johnson and William Farrar	Castle-street, Holborn	Venetian ventilator.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Dec. 10	481	William Redgrave	Croxley-green, Rickmansworth	Railway cap.
15	482	N. A. Bertsch	Castle-street, Holborn	Photographical obturator.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine,

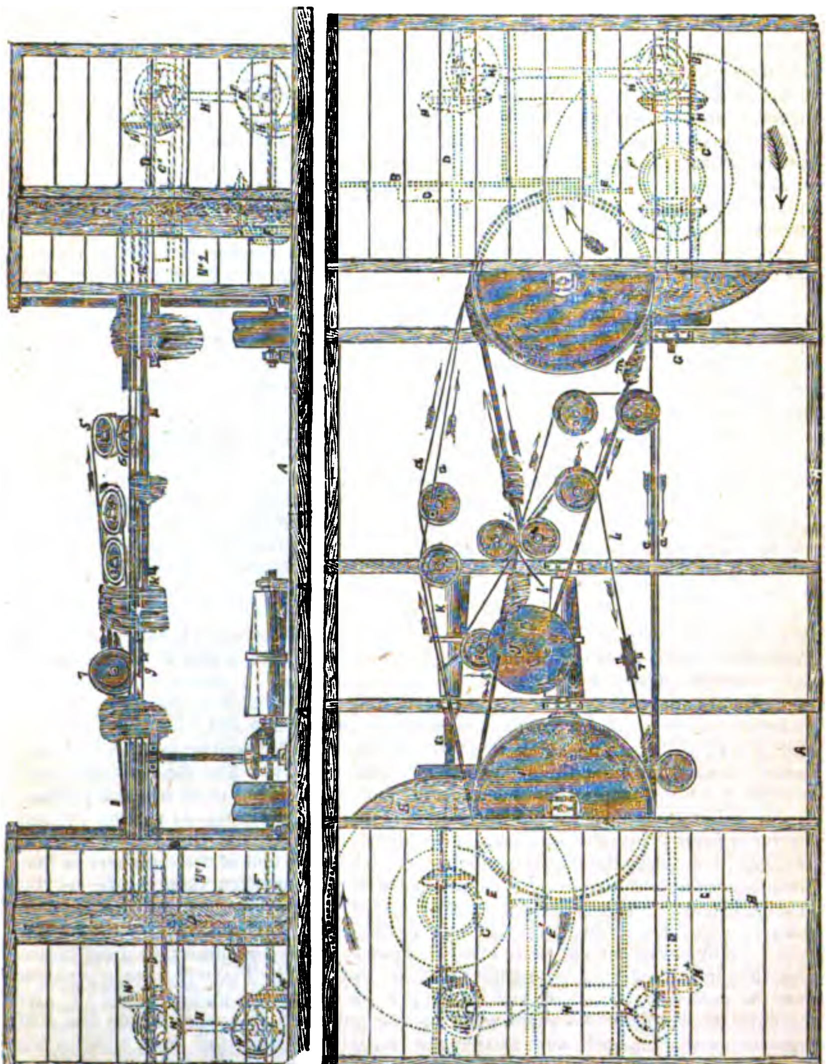
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1533.] SATURDAY, DECEMBER 25, 1852. [Price 3*d*., Stamped 4*d*.

Edited by R. A. Brooman, 166, Fleet-street.

M'BRIDE'S PATENT SCUTCHING-MACHINERY.

Fig. 1. Fig. 2.



M^cBRIDE'S PATENT SCUTCHING-MACHINERY.

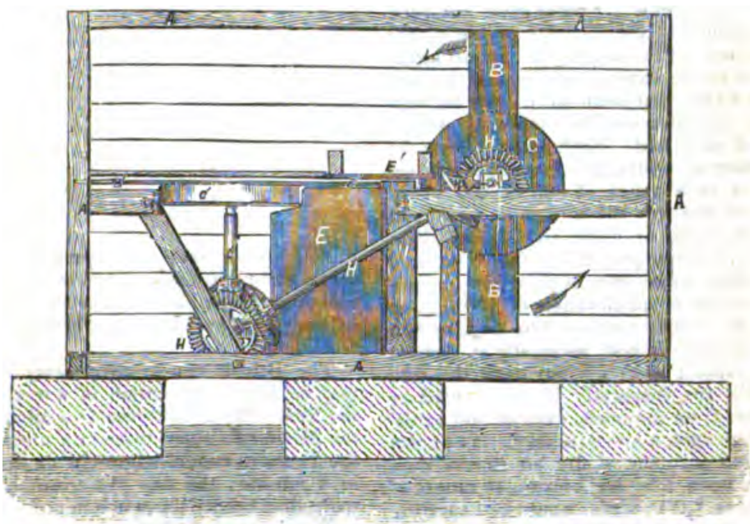
(Patent dated June 18, 1852. Specification enrolled December 18, 1852.)

The Double Scutching-mill, invented by Mr. McBride, is represented in the accompanying figures, of which fig. 1 is a side elevation, fig. 2 a plan, and fig. 3 an end elevation. A A is the general framework of the machine, which combines two scutching-mills—No. I and No. 2—fed or supplied from the same set of holders or carriers. B B^1 are the scutching-blades or handles, which are fixed in any convenient number (two only are shown in the drawings) to the discs C C^1. These discs are mounted on the shafts D D^1, which turn in bearings in the framework. E is the "stock" for the set of scutchers B, and E^1 that for the scutchers B^1, against which the flax is thrown in the operation of scutching. F is a bevel-wheel on the driving-shaft G, which gears into another bevel-wheel F^1 on the shaft of the scutchers B^1. The motion of this shaft is transmitted to that of the scutchers B, by means of the bevel-gearing H^1 H^1 on the inclined shaft H, by which means the sets of scutchers are caused to work so that a blade of each shall strike the flax or other material passing through the machine on the opposite sides; the direction of action of the blades being at, or nearly at, right angles to each other, and the plane of motion of one set of the blades coinciding, or nearly coinciding, with the axis of the other set of blades. I I^1 are holding pulleys, by which the material to be scutched is supplied to the mills, which operate in succession on opposite ends of the same; one mill scutching one end of the flax on both of its sides, and the other mill scutching both sides of the opposite end. After the material has been operated on, on both sides of one end by the first mill, it is carried through the holder, and the opposite end, or that which had not been scutched, is presented to the action of the scutchers in the second mill, where both of its sides are operated on in the manner before described; after whieh, if the material has not been sufficiently cleaned, it is again passed through both of the mills as before.

The construction and operation of the holding, carrying, and turning arrangement is as follows:—I I^1 are the holding-wheels or pulleys of the two mills, as before mentioned. These holders are connected by two endless ropes *a a*, which press into two grooves on their peripheries, and by which the flax is held during the operation of dressing. The endless ropes are kept tight by means of two stenting pulleys 1, 2, which are capable of being shifted in the direction of the arrows, so as to keep the ropes constantly tight. On the peripheries of each of the holding-wheels is another groove intermediate to those for the holding-ropes, which serve for the ropes of the carrying and turning arrangement. There are two endless ropes for each holder running in the intermediate grooves, and these ropes form the carriers. The under rope *b* from the holder I passes over the pulleys 3 and 4, and the upper one *c* over the pulleys 3, 5, and 6. The pulleys 3, 4, and 5 are raised from eight to ten inches above the plane of the wheels, and they, as well as the pulley 6, are placed obliquely to the horizontal, so that when the ropes *b* and *c* leave the pulleys 3, 4, 5, and 6, they come again to their original level (*b* passing beneath a guide-pulley 7), and thus enter the groove of the holder fairly. The flax is introduced between the ropes where they meet at the point *d*, allowing them to catch it about five or six inches above the mid-length—the pulleys 11 (in fig. 2) serving to keep the ropes pressed into the grooves. It is thus carried around the holder I of the first mill, and, after having been submitted to the operation of the scutchers in that mill, comes out between the two ropes at *e*, is carried between them as far as the point *f*, where the ropes separate to pass round their respective pulleys, and is there released, when it is immediately taken up by the carrying arrangement of the second mill. In this arrangement there are two endless ropes *g h*, similar to those before described in the carrying arrangement of the first mill. The under rope *g* passes over the pulleys 8, 9, and 10, and the upper one *h* over the pulleys 9 and 10. At the point where these two ropes close on the pulley 10, the ropes of the first mill separate on the pulley 3, and, as they are placed at a height of from eight to ten inches above the pulley 10, the flax is caught by the end already dressed in the first mill, and the undressed end falls down, and the flax being held by the dressed end, is thus carried into the second mill to be dressed on the other end. Immediately under

the double rope, passing from the pulley 10 to the second mill, is a rod of iron *k*, and the flax falls over this rod in such a position that one end of it is on each side of the rod before it passes to the holding-wheel I^1. This rod rises at the end next the wheel I^1, and the dressed end of the flax, as it passes along it, is thus raised to allow of the upper holding-rope *a* catching hold of it. It also facilitates the removal of the flax when dressed, when it is taken by hand from between the carrying-ropes at the point *m*. The pulley 9 has a broad disc *n* of tin plate, or some such light material, on the top of it, which carries the end of the flax over the rope passing from the pulley 9 to the pulley 8. As this disc also travels faster than the flax, it serves to take out of the tail of the material the bend it will have acquired in passing

Fig. 3.



through the first mill. In order to prevent straining of the holding-pulley I^1, it is made in two parts $i\,i^1$; the part i is keyed to the shaft, and has two grooves formed on its periphery; while the part i^1 turns loosely, and has a single groove. The holder I^1 of the mill No. 2 is driven from the holder I of the mill No. 1, which is set in motion by suitable gearing from the driving-shaft G. K K are differential cone-pulleys for regulating the speed of the holders. Other gearing than that described may be adopted for giving motion to the holders.

SMALL FIRE-ARMS AND THEIR PROJECTILES. BY C. A. HOLDSTOCK, ESQ.

Four nations of Teutonic descent lately made a display of arms that deserves the most serious attention. Switzerland, Prussia, the United States, and this country, showed the work of their gun-makers in producing the grooved barrel and its appendages. Another nation, chiefly of Celtic descent, attempted to emulate the rest. Let us pass some of their arms in review.

Switzerland adopts a small bore, and fires a conical projectile upon a low trajectory. The country that produced John and James Bernouilli abounds in clever mechanics and men of science, who understand the qualities essential to the rifle.

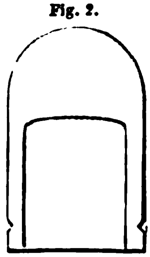
The accompanying figure represents a section of this rifle, of the actual size.

Fig. 1.

It is scarcely possible to imagine two systems more opposite than those now adopted by France and Prussia. France prefers the hollow, but Prussia fires the solid projectile. France gives but little attention to the exterior profile of the section. Prussia gives the utmost attention to the exterior profile, and depends on a shot that shall cut its way through the air, sustained by plenty of weight and solid lead. Each nation rejects the spherical figure, which confines its targets to a range of 300 or 400 yards. Each removes the targets to a range of 800 yards, or more, and strikes them with the new projectile. Yet it is found that the trajectories of these new projectiles rise to an elevation of 150 feet, or more, at long ranges. The air is seldom absolutely at rest, especially at such an elevation; and on windy days the rifle balls are frequently blown a yard or more from the mark, even at 300 yards' range upon a low trajectory. To expect much accuracy of fire on stormy days and upon lofty trajectories, at ranges of 800 or 1,000 yards, would be expecting too much.

The riflemen of the United States of America have avoided the principal errors of the French, for the Americans are no novices in the study of the grooved barrel. Rejecting, of course, the spherical shot, they saw, as well as their predecessors, that the chamber may contain the charge of powder. Fig. 2 is

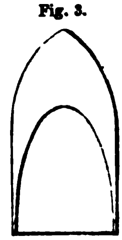
Fig. 2.



a section of the projectile belonging to the American rifle, 24 of which can be fired in one minute by that gun. The powder in the chamber is confined by a thin cover of wood, with a hole in the centre. The barrel has two grooves, each three-fifths of an inch in width, and very shallow. This projectile is defective, and the head of the shot is sometimes blown right away from the rest, leaving the cylindrical part sticking in the barrel.

Another projectile of a similar class, but of improved section, is shown in fig. 3.

Fig. 3.



Both these sections represent the actual size; but these chambers do not contain powder sufficient to command an extensive range. A defect which will be remedied.

The British two-grooved army rifle may be fired about twice in a minute; the Swiss rifle about twice in a minute; the Minié rifle about twice in a minute; the Prussian zundnädelgewehr six times in a minute; the new American rifle, more than twenty times in a minute.

The problem of the geometrical figure that is due to a military projectile, has now received three distinct solutions, pointing to the conclusion that there is one general solution, embracing each of the three as a separate case. Each of the three results permits the targets to be set up at a range of 1,000 yards or more.

The imperfections of the Minié rifle, and of its projectiles, are well known to every accomplished rifleman in this country; and experince in actual service will assist the two Governments in learning what those defects are. Sir Howard Douglas, properly observes on this point, that "It behoves us to be very cautious not to be led to prefer these foreign arms to our own, for general service."

In a paper which appeared in the *Mechanics' Magazine*, in the year 1843, I referred to the solids generated by permitting melted lead to fall through

resisting media. Though I had previously explained these views to Professor Christie, and the most distinguished members of the Board of Ordnance, they did not appear to appreciate, or to understand, the importance of the subject; and with the exception of a few accomplished civilians, it was not regarded in this country. On the Continent, the education of military men is a matter of extreme importance, and everything published in England that can possibly conduce to that object is immediately translated and carefully considered. In Prussia, the officers who in their youth had followed the Prince Field-marshal Von Blucher, are now as energetic in the cabinet as they were then in the field.

They attacked the problem of missiles as they would have attacked any other difficulty, and proved that they had conquered it by slaying some thousands of their enemies with a projectile of this class, fired from the zundnädelgewehr. At page 337 of the "Treatise on Naval Gunnery," by General Sir Howard Douglas, is an engraving of this weapon with its projectile.

The figure of the latter may be produced by carefully pouring melted lead into water.

The four-grooved rifle has been in common use in this country for many years. The projectile described as "cylindro-conical," has been known to London gunmakers for nearly half a century. The writings and the experiments of Captain Norton, the inventor of the rifle-shell, had shown many years ago what might be done with expanding shot, and the two-grooved barrel could throw projectiles that struck the target at a range of 1,200 yards.

In the exercise of my profession, I have been engaged in the education of officers, and have been led to observe that an artillery officer is placed under a disadvantage in finding that his attention is chiefly directed to smooth bored guns, and thus taken away from the construction and qualifications of grooved barrels. The brave and skilful, but unfortunate general, who commanded the armies of France from the beginning of the present century until the year 1815, had received the education of an artillery officer; and not appreciating the grooved barrel, he expelled all rifles from the armies under his command. In vain did he lose his officers by hundreds in Spain and Germany; in vain did he hear of the destructive "boulets d'officier," and acknowledge their fatal effects. No experience could remove his prejudice in favour of the smooth bore, or his ignorance of the rifle. To the end of his career he persisted in his exclusive devotion to smooth-bored guns.

Having reduced the French army to a condition, on the most important subjects in gunnery, that can only be regarded with surprise, the troops were left to make the best they could of this depressed state of military knowledge. A few years after his death, a French army was ordered to Africa; and there they acquired from the Arabs much valuable knowledge on this subject.

The superior knowledge of the Arabs was only too evident, and the French officers began to study those principles of gunnery which forty years of erroneous practice had rendered obsolete among them. Their officers, too, were able to obtain translations of all that had been published in Europe, and could find means of learning what was practically known on the subject in other countries. With this informntion to aid them, the French could not avoid improving, and their improvement is very creditable to them.

EXHIBITION OF RECENT INVENTIONS AT THE SOCIETY OF ARTS.

In the extent, variety, and generally superior character of the exhibition of recent inventions now going forward at the house of the Society of Arts, we recognize, with extreme satisfaction, another successful result of the well-directed labours of that most excellent body. Within the comparatively small portion of its long and useful career during which these exhibitions have been held, setting aside altogether the Great Exhibition of last year itself, in which their example culminated, it would be easy to point to important steps in advance which they were instrumental in originating, and still more to highly beneficial changes in the state of the law applicable to such matters, the necessity of which they rendered more apparent, and the institution of which they hastened.

In the year 1848, the Council of the Society of Arts commenced a series of annual exhibitions of the inventions of the preced-

ing twelve months. The object which the Council had in view was, to afford facilities for ascertaining the direction in which inventive men were working, and to call attention to the importance of a permanent museum of inventions, which might serve as an historical record of the ingenuity of the age. Such a museum would also show what had been already accomplished in each separate branch of art or manufacture, and by a comparison of the efforts of various minds at different periods, would form the best groundwork and guide for future practice.

The first exhibition, amongst many other things, served to illustrate, by an extensive series of instruments, the condition of science as applied to electric telegraphs at that time. It also pointed out, by means of numerous models, the methods which had been suggested for improving the construction of the paddle-wheels of steam-vessels; and still more recently for superseding them by the application of the screw-propeller. Thus the actual condition of the two great desiderata of the day—the transmission of thought along lines of wire, and the extension of steam navigation—were indicated, and progress was aided.

Encouraged by the success of this exhibition, the Council deemed it expedient to continue the course thus commenced. The second exhibition divided itself into the following classes:—Railways and their mechanism; in which was comprised increased safety and economy in the construction of the permanent ways, and in the rolling stock, especially in the fittings of the passenger-carriages, the axle-boxes, buffers, &c. Novelties in the form and principle of the pressure gauges, for steam and other engines, were also shown, and attracted considerable interest. Attention was likewise directed to contrivances connected with gas and water supply—important branches of town engineering. Meters of various kinds were exhibited in operation, so that their relative merits were capable of being tested by occular demonstration. Looms and spinning machinery also formed part of the collection.

About this period, the various novel appliances of magnetism began to excite considerable public attention, and many interesting magnetic machines were exhibited; whilst many novel contrivances for improving the sanitary condition and increasing the domestic comfort of the humbler classes were pointed out.

Still later collections have called attention to improvements in the steam engine, and machinery generally; more particularly to agricultural and horticultural implements, and the application of steam power to those machines.

These exhibitions have served to record, as it was designed they should, the leading features of the inventions of the day, and the facilities afforded by the law for protecting the interests both of the employer and of the employed. With a strong conviction of the great utility of these annual exhibitions, the Council have opened the present exhibition of the inventions of the past twelve months—the fourth of the series—in every one of the great arts of this country.

We propose to describe briefly the most important or most attractive objects in this collection whilst the exhibition remains open. It is arranged under six principal heads:—1. Motive Machines, including Railway Mechanism; 2. Manufacturing Machines and Tools; 3. Building Contrivances and Materials, and Naval and Military Mechanism; 4. Philosophical Instruments and Hardware; 5. Agricultural Improvements and Sadlery; 6. Miscellaneous, including Articles for Personal Use.

M. Fontaine Moreau exhibits a series of models illustrative of a means of applying electro-magnetism as a prime mover—the invention of M. Froment, of Paris. No. 1 in Class 1 is an electro-magnetic engine by this gentleman, in which each electro-magnet begins to act when its keeper is nearly close to it. The keepers are brought into position by an eccentric motion. By this means the great loss of power that generally takes place in electro-motive machines is said to be avoided. Another of these machines is for producing a vibratory motion. There is likewise a model of an electro-break contact, or inductor.

The same gentleman exhibited a very elegant instrument, by the same inventor, representing mechanically the results elicited by the experiments made on the rotation of the earth, by the pendulum of M. Foucault, and the simultaneous motion of the earth and of the several horizons. It is sufficient to see what passes in any latitude whatever to bring the index of the verticle circle to the number of degrees which represent the latitude, and afterwards to turn the crank-arms. The apparatus then reproduces, at the same time, with the daily rotation, the conical movements of the vertical of the place, and the circular motion of the horizon around the same vertical. The instrument shows besides, by means of the small plane adapted to the extremity, and upon the prolongation of the radius of the latitudes, the true action of the plane of the real pendulum in space. Lastly, it indicates directly and without any calculation, the measure of the ratio existing between the angular celerity of the earth, and that of the plane of the horizon, in any required latitude.

Mr. Weare exhibits a galvanic apparatus worked by a permanent battery, the power of which is regulated by means of a fixed scale, and is said to increase the longer it is in action. This instrument is extremely elegant in appearance, and the electrical arrangement is such as to generate a great amount of energy.

A great number of finely-executed models and drawings of railway engines and other mechanism are exhibited, which show at a glance the most prominent of the improvements in our locomotive system which have been introduced of late and are now acted upon. Of these the most striking are those which belong to Mr. M'Connell's new express engines. This admirable invention, which has already given ample indications of its efficiency, is intended to carry the express trains between London and Birmingham, a distance of 112 miles, in two hours. The chief peculiarity of this engine consists in the fire-box being extended into the barrel of the boiler, so as to give direct radiant heat, instead of transmitted heat surface through long tubes.

The balance water-meter, by Mr. Siemens, which was shown in operation, is said to be capable of working under any amount of variable pressure.

The alcohol-meter of Mr. J. Crockford is due to some recent discoveries in France, which have determined that the boiling point of alcoholic fluids, such as beer, wine, &c., is regulated by the quantity of alcohol they contain, without reference to their specific gravity. In the original form the boiler in which the thermometer was immersed was open; consequently, long before the boiling point of the fluid under examination was reached, a portion of the alcohol was dissipated, and a correct result could not be obtained. The improvement consists in adding a condenser of any convenient form, so that the alcohol as it rises is condensed and thrown back into the boiler. By observing the point to which the mercury rises in the thermometer, the quantity of alcohol contained in the beer, wine, &c., is ascertained.

Messrs. Thornton and Sons exhibit a glass-gauge tube for locomotive engines, the peculiarity of which is, that being made larger at the middle than at the ends, it is less liable to break from the pressure of steam within.

Messrs. Johnson exhibit drawings of recent improvements in machines for spinning and weaving. The chief of these are Macindoe's self-acting mule, and Messrs. Dickenson and Williams's power loom.

In our next Number we shall proceed with our Notice of the Exhibition, which we have not space to continue farther at present.

SOCIETY OF ARTS.

The Fourth Ordinary Meeting of the Society of Arts was held on Wednesday, the 15th instant, Robert Stephenson, Esq., M.P., F.R.S., Vice-president, in the chair.

The demands upon our space last week obliged us to defer until now a notice of the proceedings:

Mr. Norton read a paper on an Indicator for Registering Number, Distance, and Time. The first application of this invention was for indicating the number of persons passing through any given place where money was received. The author stated that attempts had been made, but unsuccessfully, to register numbers by means of a step, or tread, which alone could not indicate, as it might be acted upon maliciously or accidentally. The improvement consisted in combining the ordinary turnstile, or revolving gate, with the tread, in such a manner that the instrument was self-acting, and did not require the person in charge to use his feet on the ingress or egress of each passenger. It was capable of being used in either direction—and thus might register the numbers passing out of, as well as entering a building. This was accomplished by means of sliding-rods brought into contact with the inner surface of a semicircular cap. The distances of the entry and exit-sides of the cap were equal on both sides of the axis through which the rods passed, but varied to such an extent as to drive forward the rod when the stile was turned, and thus set in motion the register, or index. It locked itself as each passenger passed through, and would only register one at a time. The turnstile stood within a space of five feet, while those in ordinary use occupied upwards of seven feet. The arms being jointed, could be closed up so as to allow a free passage when required.

Mr. Norton exhibited several models explanatory of the machine, and pointed out the peculiarities and modifications necessary for its application to omnibuses, steamboats, theatres, &c. He also showed another form of this contrivance, by which he was enabled to set in motion a power that centralised in one point, and registered at the same time the ingress or egress from any number of stiles, situated at various distances from each other, and in different parts of a building. This arrangement admitted of instant communication being made to each turnstile, so that all the gates might be locked simultaneously at any required moment.

In the Carriage Registering - machine, motion was communicated by the road-wheel to the instrument by an eccentric fixed on the nave. This set in action a

ratchet-wheel, which acted upon a series of multiplying wheels connected with a dial situated in the inside of the carriage. On each revolution of the road-wheel a bolt, which was moved backwards and forwards by a spiral spring, acted upon a ratchet-wheel, driving it forward one tooth. Upon the bolt a guard, or stop, was fixed, to prevent more than one tooth being moved at each revolution; and on this entirely depended the accuracy of the indication. Each time the bolt was driven forward, the guard or stop was carried with it, entering a ratchet with the teeth cut in a reverse direction to those acted upon by the road-wheel. Experience had proved that ratchets, when constructed in the ordinary way, on passing over stones where the vibration was very great, were subject to slip, or to be driven forward more than one tooth by a single revolution of the road-wheel. This rendered the stop ncessary as a safe-guard; and without it, all instruments were liable to indicate a greater distance than had been actually travelled. The ratchet was the first, or main-wheel, in the instrument, and was calculated to make ten revolutions per mile run. This calculation was adjusted to suit all sized road-wheels by simply changing the ratchet. The ratchets were all of one size, and only differed in the number of teeth. The remaining portion of the train was alike for all sized road-wheels.

In another description of the instrument, the principle of the decimal rotation of the ratchet, was preserved in connection with a train of wheels and pinions, in continuous action, similar to an ordinary clock train. The ratchet was not driven by the road-wheel, but by a spring, which, when liberated, drove the ratchet. The object of this was to prevent an excessive strain being communicated to the wheels of the instrument. To these various trains of wheels the "fare" indicator was attached; so that when a person engaged a cab, the fare was indicated according to the distance travelled. The fare-dial returned to zero on the egress of the passenger; and neither passenger nor driver had any control over the indicator. When a passenger entered, a depression of the seat or floor took place, bringing into action the productive mileage-train. It ceased to act when empty, and was restored to zero by means of a lever under the control of the driver.

In the discussion which ensued, various points of detail were elicited. It was suggested that road-wheels, of diameters less than those for which an instrument was intended might be substituted by a fraudulent proprietor; and that thus instead of the register being an advantage to the public, it would be made the means of fraud. To this it was replied, that the proper diameter of the wheel for each indicator might be marked on the face of the dial, and then it would be in the power of any person to test for himself the accuracy of the combination. The question was raised, whether in the event of a passenger leaving a vehicle to make a call, the "fare" indicator would return at once to zero? Mr. Norton, in reply, stated, that by means of a lever, the driver had the power of retaining the seat in its depressed position until he had discharged his fare.

Votes of thanks were passed to Mr. Norton for his Paper, and to the Chairman; after which, the Meeting terminated.

THE TRADES OF BIRMINGHAM.

At the beginning of the week it was reported that another advance in the price of copper was about to take place, and considerable uneasiness was felt by the manufacturers. Fortunately, however, the threatened demand was not made, and purchases to an unusual amount were made on Tuesday. The copper market is usually dull at the close of the year, but this season it has been very brisk. The orders for brass, lead, and iron, and copper tubing, required for lighting Buenos Ayres with gas, are now in course of execution, and the projection of other public works in South America promises well for these descriptions of manufactures. Agents have recently visited this country on a tour of inspection, and the result has been an increase of the orders originally given. The orders received from Montevideo and other parts of South America by the last packet are highly encouraging. They consist mainly of the most useful articles of Birmingham trade; but guns, pistols, and other military appointments are in great demand.

The iron and brass lock trade of Willenhall, Wednesfield, and the neighbourhood, is unusually good, and may be considered in a more prosperous condition than at any former period. From Christmas last until Michaelmas this branch of industry was in a very languid state, and the low prices to which makers had to descend, rendered it a most unprofitable trade; but during the last six weeks it has completely revived, and manufacturers cannot execute the orders on hand. Several makers are in possession of orders for almost every description of lock, the execution of which will occupy at least three months. They cannot, however, procure sufficient hands, nor even secure the time and attention of those whom they had employed. The metal rollers are actively

engaged, and the prosperity of their mills is a fair index of the general state of trade.

Orders for boilers of various descriptions have been recently received from Port Philip and Sidney, which are being executed at the Soho Works.

The Spanish and Mexican trades are active, and for the Northern States of Europe, it is represented that there are in the hands of our merchants large orders for Birmingham merchandize. The successful professional visits of Sir Charles Fox and Mr. Robert Stephenson to two of the countries to which we have referred (to say nothing of the success of the latter gentleman in Egypt) have, according to all accounts, opened, or are likely to open, an extended market for Staffordshire iron, if not for Birmingham manufactured goods. The recent orders from North America, although not so brisk as in the summer months, are the average of those usually received at the fall of the year. From Canada last advices are represented to be more favourable, and the prospects of the future still more cheering. A great amount of the Birmingham goods sent to North America is bound for California, and an immense quantity are fire-arms. From letters we have seen from Birmingham men, emigrants to South Australia, the demand for the hardware manufactures of Birmingham and Sheffield was greatly on the increase, every additional arrival being far below the required supply. This demand renders the heavy tool-making business of the district unusually brisk, and the smithies and shops of Birmingham and the neighbourhood are extremely busy. Prices are, however, on the advance, and goods on their arrival will be found much higher than last importation.

The tin-plate business, more especially at Wolverhampton and the neighbourhood, continues quite as active as when last reported. The retail trade of the town has been brisk during the week, owing to the immense number of visitors to our great cattle and poultry exhibition.

The scarcity of coal continues, and the incessant rain which we have had during the week has enhanced the difficulty of raising it. The pits are flooded to a great extent, and it is estimated that one iron and coal proprietor in this district will lose not less than 20,000*l*. by the inundations. The colliers' notice, west of Dudley, expired on Saturday last, and it was expected they would not resume work unless they received 5s. per day. The masters consented to give them 4s. 6d., and most of them have gone down into the pits. The price of coal is still advancing, and with it the value of plate and cut glass, and other articles in the manufacture of which large quantities of it are required.

THE IRON TRADE.

Birmingham.—We stated last week that the iron market in South Staffordshire had still an upward tendency; that some masters obtained orders for delivery weeks or months hence at greatly advanced rates; and that others, entirely regardless of the declared prices last quarter-day, or of the prices which may be nominally fixed at the ensuing, made the best bargains they could effect. This state of things continues. The sudden and extraordinary change which has taken place in the demand for iron seems, indeed, to have rendered masters of all grades entirely indifferent to trade regulations as to price, whether it regards the past or the future. Curiosity is awakened as to what will be the determination of the ironmasters at their meeting to be held ten days hence, preliminary to their January quarter-day. It is the general opinion of those best informed in the iron trades, that pigs, bars, nailors' rods, and every description of iron, will go up, and that the rates then fixed will be the minimum of next quarter's quotations. It is this conviction, combined with demand and the scarcity of coal, that renders it difficult to enter into any fresh engagements with the ironmasters, and inflicts great inconvenience and annoyance upon the manufacturers of articles of which iron is the raw material. Some of the nailmasters already refuse to execute orders at even greatly enhanced prices, because of uncertainty as to the future.

Best iron is now selling at 11*l*. per ton.

The most extraordinary excitement is still kept up in this trade, and expectations of the wildest nature are indulged. Some go so far as to confidently assert that merchant bars will shortly realize 15*l*. or 16*l*. per ton. It is difficult to conjecture what policy will be recognized at the approaching preliminary meeting, or what will be declared as the nominal price of iron; but it is a fact that 10*l*. and 10*l*. 10s. have for some time been readily obtained for bars and rods, and 11*l*. 10s. for sheets; and that even at these figures many ironmasters are declining to fill their books with orders, while the demand has not experienced the slightest check. The chief difficulty that presents itself is the scarcity, and consequent exhorbitant price, of materials. The supply of both ironstone and fuel in this district seems to have suddenly become altogether inadequate to the increasing requirements of furnaces and manufactories, and, what is still worse, it is rather diminishing than

increasing, from the immense influx of water, which, to use a technical phrase, is continually "drowning out" workings after workings, and bids fair before long most materially to limit the production. With such prospects, in the face of an unusual demand for our navy and for maratime fortifications, with an unexampled activity in the export department, and with the heavy drain that is again setting in for railway consumption, it would be a difficult matter to controul the present upward movement. The immense exodus of population is also telling seriously upon the labour-market, and wages are rapidly advancing beyond all previous legitimate ratio of remuneration. Under these circumstances, however detrimental they may ultimately prove to the steady interests of the trade, we see no alternative;—speculative prices must rule for some considerable time to come.—*Birmingham Gazette.*

America.—By the Royal Mail Steamship *America*, which arrived at Liverpool on Monday, with advices from New York to the 7th, and from Boston to the 8th inst., we learn that iron in the New York market was in favour of purchasers. Scotch pig was 29 dollars, and 31 dollars at six months.

Iron in India.—There are extensive beds of rich iron ore and limestone in Kemaon, and abundance of timber for fuel. At present, however, these natural advantages appear to be wholly neglected. The ore contains about 60 per cent. of metal, but the native workmen are satisfied with a yield of 9 per cent.; and the trees are cut down and left to rot on the ground, whilst only the smaller branches are converted into charcoal. The iron which is made, however, is of excellent quality.—*Journal of the Society of Arts.*

INSTITUTION OF CIVIL ENGINEERS.

The Annual General-meeting of the Institution for the election of the President, Vice-presidents, and other members of Council for the ensuing year, and for receiving the Annual Report of the retiring Council, and presenting the medals and premiums which had been awarded, was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the chair.

The Report attributed the present extraordinary activity in public works and private enterprises, in a great degree, to the discovery of those auriferous deposits of the other hemisphere, which had been, apparently, beneficently designed to bring into active utility, the humbler, but more permanently useful minerals of the parent country.

It alluded to the general demand for the improvement of the sanatory condition of towns, the completion of the branch lines of railways, the extension of the electric telegraph to the Continent, and to India, and the vast revolution it was producing in commercial and social relations. The augmented size of steam-vessels, and the creation of docks of proportions to receive them; the rapid accomplishment of the railway across the Isthmus of Panama, with the recent survey for a projected ship canal, in the same region; and the numerous other works, in all parts of the world, confided to the skilful conduct of English civil engineers, were briefly alluded to; and the good wishes of the profession were demanded for the re-establishment of the building, in which the specimens of the world's wealth had first been exhibited, and which was now to be devoted to the recreation and instruction of that valuable portion of society, the productive classes.

The principal papers read during the past Session, were recapitulated and commented on, and the following medals and premiums presented.

Telford Medals to Captain Mark Huish, Colonel Sam Colt, Messrs. Braithwaite, Poole, Frederick Richard Window, Charles Coles Adley, Eugéne Bourdon (Paris), Pierre Hippolyte Boutigny (d'Evreux), and George Frederick White:

Council Premiums of books to Messrs. John Baldry Redman (for the third time), William Thomas Doyne, William Bindon Blood, George Donaldson, Christopher Bagot Lane, and William Bridges Adams.

Many presents of books for the Library were mentioned, and two valuable donations from Mr. H. A. Hunt and Mr. W. Radford, were particularly noticed.

Attention was directed to a portrait of the past President, Sir John Rennie, painted for, and presented to the Institution, by Mr. James Andrews; and also to a bust by Mr. E. H. Baily, R.A., of Mr. Robert Stephenson, M.P., one of the Vice-Presidents; a cordial vote of thanks was offered to these artists for the truthful portraits of two valuable and highly-esteemed members of the Institution.

The condition and progress of the Institution were described as most satisfactory, the expenses diminishing, so as to enable more volumes to be published, and the new members increasing fast—the number of members, of all classes, being now 746.

Memoirs were read of Field-marshal the Duke of Wellington, Major-general Colby, and John George Children, Honorary Members; Messrs. John Barnes, David Bremner, Robert Brunton, William Tierney Clark, Frank Forester, Thomas Grainger,

and Walter Hunter, Members; Sir John Josiah Guest, Bart., M.P., John Sylvester, and Henry Vint, Associates; and Henry Charles Rawnsley, Graduate.

The main characteristics of the civil life of the Duke were pointed out, and the cordial assistance he had frequently afforded to engineers and their works, was alluded to with feelings of warm gratitude;—the valuable services of General Colby on the trigonometrical survey were detailed, and the scientific skill of Mr. Children recognised. The great talents, theoretical knowledge, and practical professional skill of the other deceased members and associates were alluded to with pride, and the untimely loss of Mr. Forster, under peculiarly distressing circumstances, was feelingly noticed.

The resignation of Mr. J. Miller from the Council, in consequence of long-continued illness, was accepted with regret;—and at the ballot, the following members were declared to form the Council for the ensuing year:

James M. Rendel, *President*; I. K. Brunel, J. Locke, M.P., J. Simpson, and R. Stephenson, M.P., *Vice-Presidents*: G. P. Bidder, J. Cubitt, J. E. Errington, J. Fowler, C. H. Gregory, J. Hawkshaw, J. R. M'Clean, C. May, J. Penn, and J. S. Russell, *Members*; and T. Brassey and T. R. Crampton, *Associates*.

Votes of thanks were unanimously offered to the President, Vice-presidents, Members, and Associates of the Council, and to the Secretary, and the Meeting adjourned until Tuesday, the 11th of January, 1853, when it was announced that the following paper would be read, "On the Nature and Properties of Timber, with Descriptive Particulars of several Methods, now in use, for its Preservation from Decay;" by Mr. H. P. Burt, Assoc. Inst. C.E.

SOIRÉE OF THE SOCIETY OF ARTS.

On Wednesday evening the annual *soirée* of the Society of Arts was held at their house in the Adelphi, and was attended by a large number of the members and their friends, amongst whom were several of the nobility and gentlemen distinguished in scientific pursuits.

In pursuance of previous notice, an extensive collection of British and foreign recent photographic pictures was exhibited in the rooms, the walls of which were thickly covered with these exquisite productions of modern art. The intention of this exhibition was to show what had been done in the art in this country and on the continent up to the present time, to obtain a contrast on a large scale of the respective capabilities of the waxed paper, the albuminised glass, the albuminised paper, and the collodion processes, and to effect a great *réunion*, of photographers, with a view to the more successful prosecution of the subject. With reference to every one of these praiseworthy objects, the exhibition must be regarded as most successful. The collection comprised 397 catalogued pictures, in which the name of the photographer and the exhibitor, and also the process employed in producing them, were stated; and there were about as many more subjects not included. England and France are the only countries whose photographical skill was represented in this splendid exhibition, and their respective contributions evidence an emulation every way worthy of them. Of the general beauty of these pictures, it is impossible to speak too highly. The absolute truth of the outlines tells irresistibly on the educated eye, while the arrangement of the masses of light and shade, and the effects of tint and tone, produce an impression indescribably striking. Between the French and the English subjects selected, there is, however, a decided difference. The French artists have delighted in the magnificent *coups d'œil* presented by the picturesque cities, fortresses, churches, and palaces of their country—the living triumphs, or the decaying monuments of man's genius and pride, while our own prefer to indulge in rural scenes and picturesque views. Many have been taken in continental countries, and these in general exhibit the advantage of the clearer skies of the south for photographic purposes. A few from Venice and the south of France are exquisitely perfect.

Mr. Roger Fenton read a paper on the present position and future prospects of the art of photography. It commenced with a rapid glance at the first progress of the art, after the production of sun-pictures upon paper by Mr. Fox Talbot, notwithstanding the prejudices which his elegant discovery is said to have excited among our artists. The camera, indeed, so far from having superseded their skilled hand labour, had given them the means of obtaining with ease a perfect transcript of Nature, still leaving full scope for the talents of the artist. In France the daguerreotype process had been prosecuted almost to the exclusion of the photographic, but latterly Mr. Talbot's discovery became fully appreciated, and it was studied with perseverance and success. Patent rights in this country had considerably impeded the cultivation of the subject; but this obstacle had been almost entirely removed, and the Great Exhibition had given an immense impetus during the last year and a half. Progress was sufficiently

indicated in the greatly-increased numbers, of students. and in ther generally increased dexterity. The art itself had been improved by the general use of new deoxidising agents, and by the power of smoothing the surface of the paper to enable it to take a sharper negative impression. Means had also been invented for keeping it in a sensitive state, and uninjured, for a longer time. The introduction, under various modifications, of collodion, as a medium for receiving the sun pictures, was attended with many advantages—great rapidity of impression, excellence in the picture produced, and susceptibility of obtaining either a positive or a negative picture, according to the intention of the operator. Another improvement introduced into the art was the construction of a kind of lens for the camera, of such a nature as to absorb the chemical rays of the light passing through it. Notwithstanding this, the camera continued to labour under several disadvantages. On the question of process, the best of the French photographs have been taken on glass, by means of albumen, of which the views taken near Lyons, and some of the ceilings of the Louvre, are exquisite specimens. English artists have produced their best works on paper, and no French specimens can excel them in delicate beauty and grandeur. This circumstance is the more gratifying to observe, as it is admitted that the true aim of the art should be the perfection of the paper process. We owe to the French the albuminised glass process, the improvement of that by waxed paper, and the use of an air-pump to iodise and excite negative paper in vacuo. On the other hand, we ourselves have perfected the negative picture with a single lens, in the shortest time, and also, what promises to become the perfection of the art, the collodion negative upon glass. The artists of the United States have greatly distinguished themselves in photography, and it is being successfully cultivated in Germany, Austria, and Russia.

The paper, which was listened to with great attention, was warmly applauded, and the exhibition continued for several hours to attract the closest examination, and to excite the warmest admiration of its many beauties.

THE "GREAT BRITAIN" STEAMER IN TABLE BAY.

Table Bay never presented a more busy scene in times of peace than on Wednesday last, from swarms of visitors going to and from the *Great Britain*. A French war steamer of a large class was also in the bay, but the *Great Britain* reminded one of St. Paul's and the minor churches in London, from the contrast her towering dimensions afforded to the other vessels in the bay. The French war steamer, the *Archimède*, at a distance appeared as if alongside it, but was quite swallowed up in its shadow, leaving nothing but the paddle-boxes to be seen, as if attached to the *Great Britain*. The scene on board this huge novelty beggars all description. The day was excessively warm, and the breeze from the north-west favourable to boating, but no one ever expected, till on board, to have seen such a crowd, so dense that all possibility of coaling for some hours was out of the question. The most remarkable feature in this affair was the immense number of Cape Dutch families, most of whom had never been on the sea before, but could not withstand the temptation to visit this wonder of wonders. A great many people came also from the country, and, notwithstanding the crowd, the heat, and the crushing, the coals and the water, all seemed highly delighted. Indeed it required no small degree of forbearance and patience at such a busy time to be thus obstructed and overpowered by numbers. From the kindness and attention of Captain Mathews and his officers, however, every opportunity and assistance was given, that they might inspect the whole economy of this floating city. More than one fair face brought home evidence of having been among the coals. The town and neighbourhood have never been so lively in our recollection for such a continuance, and the arrival of more passenger ships is likely to keep up this healthful excitement. It is truly refreshing to see so many honest, good-looking English faces among us.—*Cape paper.*

THE GREAT INDUSTRIAL EXHIBITION OF 1853.

The progress of this important undertaking is now watched with the deepest interest, not only in the United Kingdom, but also throughout the greater portion of continental Europe. The principal cities of France, Belgium, and Prussia will be exhibitors, headed respectively by the Emperor Napoleon and their Majesties King Leopold and Frederick William the Fourth, each of whom has graciously promised to contribute largely from their private collections exquisite specimens of the *vertu* art and manufactures of their kingdoms. To this list can now be added the Austrian dominions, arrangements having just been entered into, with the express sanction of the Emperor Francis Joseph, between the Imperial Royal Government in Vienna, and the Imperial Royal

Austrian Consulate in London, for the publication and circulation throughout the whole of the Austrian territories of the rules and regulations issued by the Committee of the Exhibition, for the transport of foreign goods, reception of articles, &c. The Government have likewise been pleased to issue special invitations to all the Austrian manufacturers, to contribute specimens of their handicraft to the Exhibition. The various Chambers of Commerce have also been instructed to collect all applications for space, and to transmit them to Dr. William Schwarz, the Austrian vice-consul general in London. And, as an additional mark of his Majesty's interest in the Exhibition, directions have been issued, that all goods for the Exhibition shall be forwarded over the railways, throughout the Austrian dominions, to the frontiers of Saxony, free of every expense to the exhibitors. The Swiss Government are likewise alive to the importance and interest of the Exhibition, a communication having last week been received from Mr. Prevost, the vice-consul of the Swiss Confederation in London, requesting that the fullest information may be immediately forwarded to him, as it is the wish of the leading watchmakers at Geneva, and the other manufacturing towns of Switzerland, to send a choice collection of the beautiful articles for which they are so justly celebrated. The progress which the Exhibition is making in the United States is also very gratifying. Letters have arrived from Mr. Edmond Grattan, the British consul at Boston, stating that the local committees, under the presidency of Mr. Abbott Laurence, the late United States ambassador to England, had been formed at New York, Boston, and Philadelphia, and were actively at work in promoting the interests of the Great Industrial Exhibition of 1853.

THE NEW CUNARD STEAM-LINER "ARABIA."

The splendid new steam-ship *Arabia*, Captain Judkins, for the Liverpool and New York Royal Mail Service, was tried down the Frith of Clyde on Saturday last, and gave entire satisfaction. The length of the *Arabia* is 285 feet, keel and forerake: beam, 41 feet; depth, 28 feet: tonnage, by customhouse measurement, 2,393 37-100 tons. Among the party on board we observed the Hon. and very Rev. the Dean of Ripon; Captain Kingcombe R.N., and officers of her Majesty's screw steam-frigate *Simoon*, Captain Montressor, and officers of the 82d Regiment, at present stationed in Glasgow; Mr. Dinnen, Admiralty engineer inspector; Mr. Waterman, Admiralty shipwright surveyor; Messrs. Robert Napier, Robert Steele, jun., George Burns, James Burns, John Burns, Thomas Buchanan, James Wright, J. A. Anderson, J. G. Kinnear; Captain Douglas, Mr. E. D. James, postmaster; and Mr. Archd. Gibson, secretary to the Caledonian Railway. Notwithstanding the inclemency of the weather, we were glad to see a number of ladies present. The *Arabia* immediately proceeds to Liverpool, whence she carries the mails of the 1st of January to the United States. The Venerable Dean of Ripon informed the company that he was on board Fulton's experimental little vessel when she was tried on the American waters some forty-eight years ago. She was a tiny, fragile craft, and being without paddle-boxes, threw so much water on board as almost to drown the small number of persons who were courageous enough to make the excursion. Now he was on board the *Arabia*, which was in every sense of the word a floating palace, possessing every requisite for safety, and all the conveniences, comforts, and even the luxuries of life. Such was the immense march of improvement in the experience of one man; and he might add, that it would not be rash to predict that some of the younger members present might yet witness as great an improvement over the magnificent *Arabia* as he himself had seen over Fulton's first attempt.—*Glasgow Herald.*

CARPENTER'S SCREW PROPELLER.

On Thursday afternoon, at two o'clock, his Grace the Duke of Northumberland, accompanied by Lord Colchester and a party of naval officers, paid a visit to Mr. Green's yard, Blackwall, for the purpose of inspecting Captain Carpenter's new plan of employing the screw propeller. The vessel in which this invention was applied is intended for a steam tender to Captain Leyland's yacht, *Sylphide*, during a cruise in the Mediterranean; she is, however, more especially designed for the purpose of demonstrating the principle of propelling vessels with two screws instead of one, and steering by two rudders instead of one, which is the great feature of Captain Carpenter's patent.

Experience has proved that a single screw is liable to get damaged, in which case the vessel is immediately placed in a perilous position, as has been proved by the first vessel going direct to Australia. One object of the double screw is to provide a safeguard against such a misfortune—and the same with the double rudder. The tender is in a very forward state. The screws and rudders are in their place, and she is expected to be launched in the course of ten days.

The distinguished party of naval officers who saw the contrivance expressed themselves warmly in its favour.

ENGLISH AND IRISH MAGNETIC TELEGRAPH COMPANY.

It is with pleasure we see that the English and Irish Magnetic Telegraph Company are coming before the public, already having quietly constructed, or made arrangements for the completion of their extensive system of telegraphs, which will at last, we think, afford what we have long needed,—a sufficient and certain means of communication.

Their main lines being laid underground, will obviate that uncertainty which has hitherto been experienced in the working of the overground system in wet weather.

The London, Manchester and Liverpool line of this Company will be of the most approved construction; and is estimated, we think fairly, to be able to meet the whole of the requirements of the public between these the three largest towns of England.

A large portion of the lines of the Company in the United Kingdom are already completed.

LOVER'S SYPHON.

An extremely simple and ingenious syphon has been contrived by Mr. William Lover, a surgeon and lecturer on the physical sciences at Dublin, which promises to come largely into use, particularly for philosophical purposes. It consists in adding an elastic bag to the longer leg of the instrument, communicating freely with it a little above the extremity. When intended for use, the air is to be expelled from the bag by pressing it with one hand, and the end of the tube close to it is to be shut by a finger of the other, if there be no cock upon it. Upon plunging the shorter leg of the instrument into the fluid to be drawn off, and releasing the bag without removing the finger from the end of the tube, the partial vacuum which will be created within it will raise the fluid over the bend of the tube, and fill the longer leg. It will then only be necessary to remove the finger, or to open the cock, to set the syphon in action. This is evidently a convenient means of filling the instrument, far preferable to suction, or to pouring fluid into it beforehand.

HODGSON'S PARABOLIC SCREW PROPELLER.

We have received a letter from Mr. R. Hodgson, the inventor and patentee of the parabolic screw propeller, enclosing a copy of the last testimonial of its efficiency, in support of our vindication of its merits whilst reviewing the large work of Mr. Bourne. Mr. Hodgson complains that his invention, and the performances of his propeller, have not been fairly dealt with by Mr. Bourne. He says that the engraving which Mr. Bourne gives of the instrument as much resembles the fly-vanes of a patent-log; and he refers to a number of testimonials with which he furnished the author, as affording a complete answer to his observation, that it had not been sufficiently tested to enable any one to form an opinion of its merits. Mr. Hodgson states further, that his propeller has been found in practice to increase the speed of the vessel, with a reduction of from 15 to 20 per cent. of the power, and to remove almost entirely the vibration occasioned by the action of the screw. This latter circumstance he considers to be the natural result of the difference between the helical and parabolic forms of the instrument.

Mr. Hodgson submits the testimonial above referred to, among others, and we think it due to him to give publicity to it The following is a copy of it:—

"MR. R. HODGSON,

"Sir,—Your patent parabolic propeller has now been in use in our steamer, the *Fairy*, about two months, and I have great pleasure in expressing my satisfaction with the advantages obtained from the working of it. The speed of the vessel, Captain Wise reports, is increased half a knot an hour, with a reduction from 34 to 27 revolutions of the engines per minute.

"In addition to these advantages, I am also glad to say that the vibration which was caused by the propeller previously in use in the *Fairy* is very nearly removed, it being now so trifling as to be scarcely noticed.

"I am, Sir, yours truly,
(Signed) "ROBT. COOK,
"Managing Owner.

"Lynn, June 18, 1852."

By the *Queen of the South*, intelligence has been received that the screw steamer *Larriston*, which left Plymouth on the 27th of November, arrived at Teneriffe on the

3rd of December, having made the passage in six days (the first two days against a strong head-wind and sea); being the quickest ever effected by any screw vessel. Her captain expressed a belief that he would reach the Cape of Good Hope in 25 days from Plymouth.

Submarine Telegraph at Quebec.—The process of laying down the submarine wire across the Bay of Quinte, for the trunk line of telegraph now in course of construction between Quebec and Detroit, was gone through at the end of last month. The wire, which works admirably, was manufactured in London.

New Application of Daguerreotype Apparatus.—The Austrian government has ordered that when serious accidents shall occur on any of the railways belonging to the State, a daguerreotype shall be immediately taken of the train, in order to facilitate the investigation into the cause. For this purpose the daguerreotype apparatus is to be sent to all the stations. This system has already been adopted in Prussia with marked advantage.

The Caloric Ship "Ericsson."—By the last accounts from America, we learn that one wheel of the caloric ship *Ericsson* had been moved by the unaided action of the apparatus upon the atmosphere; no fire being used. The trial trip had not taken place.

ENGLISH SPECIFICATIONS ENROLLED DURING THE WEEK ENDING DECEMBER 23, 1852.

SAMUEL MORRIS, of Stockport. *For certain improvements in steam-boilers.* Patent dated June 3, 1852.

These improvements consist in fixing or placing under the combustion-chamber of steam-boilers an apparatus or chamber, having a door through which access to the interior parts of the boiler is afforded. This chamber serves also the purpose of a dust-hole, and by furnishing it with air apertures, air may be admitted, so as to ensure the consumption of the smoke, &c., in the combustion-chamber.

Claim. The placing or fixing an apparatus under the combustion-chamber of steam-boilers for the purpose of an entrance-box and dust-chamber.

ROBERT HARDMAN, of Bolton, Lancaster. *For improvements in looms for weaving.* Patent dated June 5th, 1852.

The patentee describes and claims:

1. An improved construction of Jacquard engine. 2. An improved combination of machinery for regulating the taking up of the cloth. 3. An improved combination of machinery for regulating the position of the drop-boxes. 4. An improved combination of machinery for governing the picking motion. 5. The application of Jacquard engines to regulate the taking up of the cloth. 6. An improved combination of machinery for stopping the loom in the absence of the weft.

WILLIAM GRATRIX, of Salford. *For certain improvements in the production of designs upon cotton and other fabrics.* Patent dated 8th June, 1852.

Mr. Gratrix's improvements consist in producing designs on cotton and other fabrics.

1. By printing and partially diffusing upon the fabric one or more portions of the dyeing materials suitable for producing the desired colour, and subsequently applying the other portion or portions to complete the process of dyeing.

2. By applying one portion of the dyeing material intended to be used for the design by means of a soft substance suitable for causing it to be diffused with a diminishing shade, and completing the design by applying dyes or colours upon the fabrics so treated.

ENOCH TOWNEND, of Keighley, York. *For certain improvements in the manufacture of textile fabrics.* Patent dated 8th June, 1852.

The improvements claimed under this patent consists in forming two or more selvages within the edges of the cloth, by causing two threads for each selvage alternately to cross with another thread previously to being shed.

LAURENT MACHABEE, of Avignon. *For an improved composition applicable to the coating of wood metals and other substances to be preserved from decay.* Patent dated 8th June, 1852.

This improved composition is formed by melting together 3½th oz. of vegetable tar, one oz. of mineral tar, one-sixth oz. of "resin turpentine of Pinus Larix," one-third oz. of wax, one-sixth oz. of white grease with or without the addition of one-third oz. of Roman cement, and a like quantity of hydraulic lime reduced to a fine powder and sifted. The latter ingredients are added to the others when in a boiling state, but only in cases where the finished mastic is to be exposed to the action of

heat. The mastic is applied to the coating of wood, metallic surfaces, and brick-work, by laying it on with a brush, while hot, and any number of coatings may be used; care must be taken that the surfaces to be covered have been previously cleaned, or the effect of the mastic will be counteracted; when used for covering the interior of walls, a coating of plaster is laid on outside the mastic.

Claim.—The combination of the agents enumerated for the production of an improved mastic, and the application of the same for protecting iron, wood, brick-work, and other hard bodies and articles made of wood and iron, covered therewith from the destructive effects of air and humidity.

WILLIAM REID, of University-street, electric-telegraph engineer, and THOMAS WATKINS BENJAMIN BRETT, of Hanover-square, gentleman. *For improvements in electric telegraphs.* Patent dated June 12, 1852.

The objects of the present improvements are, firstly, to provide a more ready means of laying down telegraphic wires in streets; and secondly, to produce a flexible protective covering for insulated submarine wires.

The first of these is effected by the employment of gutter-shaped troughs of various forms, circular, V-shaped, and rectangular, which are closed by lids or covers fitting into recesses in the upper sides of the troughs, and not requiring necessarily the employment of bolts or other fastenings to secure the parts together.

The second object is attained by employing a tubular chain, the links of which are formed so as to fit into each other in the manner of vertebral joints, admitting of a certain amount of movement, and at the same time affording a most efficient protection.

EDWYN JOHN JEFFERY DIXON, of the Royal Slate Quarries, Bangor, and ARTHUR JOHN DODSON, of Bangor, gentleman. *For improvements in machinery and apparatus used in quarrying slate and stone; and in cutting, dressing, planing, framing, and otherwise working and treating slate and stone, and in apparatus and wagons used for moving and conveying slate and stone; and improvements in framing, joining, and connecting slate and stone.* Patent dated June 12, 1852.

The specification of this patent embraces a variety of contrivances (not all of them distinguished by absolute novelty) for effecting the several operations in slate and stone working mentioned in the title. Amongst the machinery described we find—1. An arrangement for sinking shafts, in which a stone drill or jumper is worked at the edge of a revolving turntable, so as to cut a continuous circular groove, leaving a core, which is afterwards blasted out, to form the well or sink. The jumper is worked, and the turntable driven by gearing from a vertical shaft; but after the first blast, which is generally made when the boring has reached a depth of about thirty feet, the turntable, drill and its appendages are lowered into the shaft and worked by a small portable engine. 2. An improved hand-jumper, the ball of which is capable of sliding on the stem, so as to enable the range of working of the jumper to be increased. 3. An arrangement of horizontal drills driven by a hammer action for cutting artificial foot-joints to facilitate the removal of slabs or tables of slate. 4. A sawing-frame, having two adjustable saws which act simultaneously on the opposite edges of a slab, and cut it to another required width. 5. Another sawing frame, in which the feed-table has a compound motion, being capable of rising to and receding from the saws, thus enabling grooves to be cut in slabs or blocks to any desired depth, or the blocks to be severed at will. 6. A cutting-machine, where the edges of the slates (for roofing or other purposes) are removed by polygonal flanges attached to the holding-wheels by which the slates are kept down to the table. 7. Another cutting arrangement, in which this operation is effected by revolving discs acting like shears on the slate placed between them. 8. A lever-cutter, working in a manner similar to a tilt-hammer, the hammer-head being replaced by a cutting-blade. 9. A "guillotine" cutter, the action of which is explained by its name. 10. Another form of cutter, which is a segment of circle attached to a segmental framing, and worked by a pendulum motion. 11. A cutter-frame, in which the cutters or drills are worked similarly to mine stamps. 12. A planing machine, simplified by its having two motions only, that of the feed against the plane-iron, and the regulating motion for the adjustment of the plane-iron, which is made sufficiently wide to plane the whole breadth of a slab. 13. A locomotive engine, working and carrying its own saws or cutters. 14. An arrangement for nicking circular saws while at work. 15. Several improved constructions of trucks and wagons, and of lubricating axles for the same. 16. A system of machinery for sawing and cutting the frames of school-slates. 17. A variety of modes of applying gutta percha, India-rubber, &c., in forming connections between abutting edges of slabs of slate, and in securing school-slates in their frames.

JAMES NORTON, of Ludgate-hill, merchant. *For improvements in apparatus for ascertaining and registering the mileage run by public vehicles during a given period; also the number of persons who have entered in or upon or are travelling in public vehicles; part of which implements is applicable to public buildings and other places where tolls are taken.* Patent dated June 17, 1852.

Mr. Norton's ingenious registering apparatus will be found fully described in another page (*ante* 507). The claims embrace the several arrangements described, and particularly dwell on the distinguishing features adverted to in our notice.

THOMAS RESTELL, of Kennington, watch manufacturer. *For certain improvements in the construction of lamps and burners.* Patent dated June 17, 1852.

The patentee describes and claims—

1. An improved mode of raising and lowering the wick in lamps having collapsible holders by the employment of a spiral, or screw working into a nut on the holder, which is guided so as to ascend in a correct vertical line.

2 A mode of admitting air to lamps for supporting equable combustion.

3. The employment of a chain and chain-pulley for winding up the spring of pressure lamps, and of an oil-cup around the wick-holder for the purpose of extinguishing the flame of the wick without producing smoke, by lowering it into the oil-cup; and the adaptation of collapsible wick-holders to pressure lamps.

4. A railway traveller's lamp, having a strap attached, by which it can be fastened to the leg of a traveller, and provided with a vesta light box for facilitating the obtainment of light for the lamp.

5. A hollow candle lamp, in which the candle is made in the form of a ring, the wick-holder being at the centre, and raised and lowered by the ordinary means.

WILLIAM CARDWELL MCBRIDE, of Alistragh, Armagh, farmer. *For certain improvements in machinery for scutching, or otherwise preparing flax and other like fibrous materials.* Patent dated June 18, 1852.

A full description of Mr. McBride's new machinery will be found as the first article of our present Number.

RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Co., of 166, Fleet-street, London, patent agents. *For improvements in the manufacture of wheels, tyres, and hoops.* (A communication.) Patent dated June 18, 1852.

We shall take an early opportunity of laying before our readers the complete details of this invention.

Specification Due, but not Enrolled.

GEORGE PATE COOPER, of Suffolk street, Pall-mall East, tailor. *For certain improvements in fastenings for garments.* Patent dated June 12, 1852.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated October 30, 1852.

572. Henry Brinsmead. An invention for shaking straw to be attached to thrashing-machines.

Dated November 9th, 1852.

684. Thomas Dunn and William Watts, jun. Improvements in the construction of railways.

Dated November 19th, 1852.

784. Robert Walker. Improvements in the construction of portable houses and other erections.

Dated November 27th, 1852.

891. Harry Winton and Francis Parkes. Improvements in the manufacture of agricultural and horticultural forks, and pronged or toothed instruments and hoes.

Dated November 30th, 1852.

911. John Addison. Ascertaining the hour of the day by means of a pocket sun dial.

912. William Jeffs. Improvements in manufacturing letters, figures, and ornamental work, and in the mode of attaching the same to wood, stone, iron, and certain other materials.

913. James Murdoch. Certain improved materials for use in painting. A communication.

914. James Mayelston Haldon. Certain improvements in the means of rendering wood imperishable and uninflammable. A communication.

915. Samuel Clarke. Improvements in lamps.

916. Allan Craig. An improved crane and apparatus connected therewith.

917. John Brannis Birch and Eugenius Birch. Improvements in forming drains, and introducing pipes or tubes into the earth.

918. Joseph Skertchley, jun. Improvements in mangles and mangle-rollers.

919. James Barlow. Improvements in stands or supports for casks, barrels, and other like vessels.

920. Thomas Parramore and Samuel Lewis. Improvements in articles of wearing apparel.

921. George Fitt. Obtaining mechanical motive power and speed.

Dated December 1st, 1852.

923. Charles Hart. A thrashing, straw-shaking, riddling, and winnowing machine combined.

924. William Slater. Improvements in ovens and apparatus for baking.

925. George Augustus Huddart. Improvements in the construction of boilers and furnaces for generating steam.

926. Charles Walker. Improvements in the method of purifying water for steam boilers and other purposes.

927. Robert Milligan. Improvements applicable to combing-machinery.

928. William Morris. Improvements in the production of motive power, and in apparatus pertaining thereto.

929. Frederick William Green. Certain improvements in the mode of propelling ships and other vessels.

Dated December 2nd, 1852.

930. John Dable and William Wells. An improvement in rolling metals.

931. Robert Kirke. An improved grate or apparatus for burning fuel, especially adapted for anthracite coal, whether used under reverberatory furnaces or boilers, or with or without a blast.

932. William Taylor. Improvements in propelling ships and other floating bodies.

933. James Rothwell. Certain improvements in looms for weaving.

934. William Keld Whytehead. Certain improvements in steam engines and steam boilers.

935. James Edward McConnell. Improvements in locomotive engines.

936. John Norton. Improvements in shot or projectiles.

937. Ebenezer Poulson. An improved mechanical purchase, applicable to working ships' and other pumps, and to similar purposes.

938. Charles Millar. Improvements in timekeepers or clockwork, and in machinery or apparatus worked in connection therewith.

Dated December 3rd, 1852.

939. James Newall. Improvements in breaks, machinery, or apparatus applied to railway and other carriages in motion, and in the mode or method of connecting two or more of such breaks together.

940. Noble Seward. Improvements in applying hydro-pneumatic agency for obtaining motive power.

941. Thomas Collins Banfield. Improvements in the process and apparatus for extracting saccharine and other juices from beetroot or other roots and plants. A communication.

942. Peter Walker and Andrew Barclay Walker. Improvements in fermenting ale and porter and other liquids.

943. Henry Hitchins and William Batley. Improvements in producing raised surfaces and imitations of carvings from materials not hitherto similarly applied.

944. Page Dewing Woodcock. An improved preparation or pill for medicinal purposes, hereby denominated Page Woodcock's Wind Pills.

945. Cornelius de Bergue. Improvements in and applicable to looms for weaving. A communication.

946. George Ware and Albert Henry Fernandez. Improvements in the making of wedges or keys for holding or tightening the rails within railway chairs.

947. John Neale. Improvements in back fastenings for Venetian and other swing shutters or blinds, and also for swing windows and doors.

948. George Stiff. An improved construction of printing-machine.

949. John Bethell. Improvements in machinery or apparatus for digging and cultivating land.

950. John Bethell. Improvements in steam-engines.

951. Arthur Wall. Improvements in preparing sheet metal for shipbuilding and other uses.

952. Duncan McNee. A machine for printing with colours on cloth, and which is also applicable for printing ornamental designs on paper.

953. Richard Archibald Brooman. Improvements in the manufacture of sugar. A communication.

954. Samuel Neville. Improvements in the manufacture of lamp-glasses and globes.

955. William Keates. Improvements in fireboxes for locomotive and other steam-boilers.

Dated December 4th, 1852.

956. John Thornborrow Manifold and Charles Spencer Lowndes. Improvements in the method of extracting the juice from the sugar cane.

957. John Rowbotham. Improvements in timekeepers and apparatus connected therewith for ascertaining the attendance on duty of watchmen and other persons having charge of property. A communication.

958. Alexander Lawrie. Improvements in the manufacture of oars and similar articles.

959. James Murdoch. An improved galvanic battery. A communication.

960. Joseph Bentley. Improvements applicable to fire-arms.

961. Joseph Cliff. Improvements in the mode of making and compressing bricks, lumps, tiles, quarries, terra cotta, and other similar articles.

962. William Maugham. Improvements in rendering wood fireproof.

963. George Frederick Parratt. Improvements in portable bridges or pontoons.

964. Isac Lewis Pulvermacher. Improvements in pipes and cigar-holders.

Dated December 6th, 1852.

965. Denis John Murphy. An improved agricultural-machine, which he calls the Archimedean agricultural-machine.

966. James Buchanan. Improvements in the treatment of flax and other similar vegetable fibrous substances, and in the machinery employed therein.

967. Richard Archibald Brooman. Improvements in saws and saw-mills. A communication.

968. Guillaume Ferdinand de Douhet. Improvements in the manufacture of alcoholic, saccharine, and starch products.

969. André Jacques Amand Gautier. An improved treatment of peat.

970. Asa Lees and Thomas Kay. Improvements in machinery for spinning and doubling cotton, wool, silk, flax, and other fibrous materials.

971. Frederick Mackellar Gooch. Improvements in the construction of railway signals, and in machinery or apparatus for working railway signals.

972. Charles Alfred Jordery. Improvements in the construction of the bodies of cravat collars, and stocks and stiffeners, and in the ornamenting of cravat collars, and stocks in general.

973. Richard Laming. Improvements in purifying gas, and in obtaining from the products resulting from the purification of gas certain useful compounds.

974. Edward Tucker. Improvements in the manufacture or production of starch.

975. William Paton. Improvements in the manufacture of driving-bands for machinery.

976. John Norman. Improvements in the mode of making and setting the square sails of ships or vessels of any size and description.

977. William Blackett. Improvements in steam-boilers.

978. James Smith. Improvements in paving roads and other surfaces.

980. Thomas Conolly and William Cotter. Improvements in propelling vessels.

Dated December 7th, 1852.

981. Pierre Duchamp. An improved Jacquard-machine.

982. Peter Armand Lecomte de Fontainemoreau. Improvements in constructing the bars of furnaces and grates. A communication.

983. John Henry Johnson. Improvements in weaving carpets and other fabrics, and in the machinery or apparatus employed therein. A communication.

984. Thomas Challinor. Improvements in apparatus to be applied to decanters and other bottles to facilitate the running off liquids therefrom.

985. William Mayo. Improvements in balls or float valves and cocks.

986. James Norton. An improved mode of transmitting motive powers.

987. Alfred Vincent Newton. An improved mode of transportation for the conveyance of letters, packages, freight, or passengers, from one place to another. A communication.

988. Samuel Aspinwall Goddard. Improvements in the construction of pistols.